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OF THE

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OF THE

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BULLETIN

OF THE

INTERNATIONAL RAILWAY CONGRESS

ASSOCIATION

(ENGLISH EDITION)

[385 .(06. 112]

THIRTEENTH SESSION

Paris, 1-12 June 1937.

GENERAL PROCEEDINGS

First Section : **WAY AND WORKS.**

INAUGURAL MEETING

June 2nd, 1937.

PROVISIONAL CHAIRMAN : THE RIGHT HON. LORD ROCKLEY,
MEMBER OF THE PERMANENT COMMISSION OF THE ASSOCIATION.

— The Meeting opened at 9 a.m.

The Chairman. — Gentlemen, I have been requested by the Permanent Commission to preside over the opening Meeting of the 1st Section and to make up its Secretariat.

On behalf of the Permanent Commission, I suggest that Sir Ralph WEDGWOOD, Chief General Manager, London and North Eastern Railway, be elected as *President. (Applause.)*

As Sir Ralph Wedgwood will not arrive before to night or to-morrow, I shall, with your approval, preside over your debates during his absence.

As *Vice-Presidents,* I propose to appoint :

Mr. Y. HASHIGUCHI, Chief of the Rail-

way Research Service, Japanese Government Railways;

Sir Walter NUGENT, Chairman, Great Southern Railways (Ireland);

Mr. MELLISSINOS, General Manager of the Hellenic State Railways;

Mr. PHILIPOFF, Chief Engineer of the Bulgarian State Railways,

and as *Principal Secretary* : Mr. J. DUBUS, Engineer, Permanent Way Department of the Belgian National Railways Company. *(Marks of approval and applause.)*

— The Section, following the President's proposal, subsequently completed its Bureau and drew up a provisional agenda.

— The Meeting was then closed.

Revision of the Rules and Regulations of the International Railway Congress Association.

— The Meeting was reopened at 9.30.

The President. — Before dealing with Question 1, we have to take a decision as to the alterations to Articles 2 and 4 of the Rules and Regulations of our Association, proposed by the Permanent Commission.

(The proposed alterations were read out.) (*).

I hope this Section will agree as to these modifications, the object of which is to facilitate the admission of new Members.

— *The Section unanimously expressed its agreement.*

Furthermore, in compliance with Article 21 of the Rules and Regulations, we have to appoint a delegate to the Special Committee entrusted with the examination of the proposed revision.

I suggest that Sir Ralph WEDGWOOD be appointed in this capacity. *(Applause.)*

— *The Section then passed on to the discussion of Question I.*

(*) See wording of the proposed alterations in the September 1937 number of this *Bulletin,* p. 1962 (Summary of Proceedings, Paris Congress, 1937).

[625.14]

QUESTION 1.

The construction of modern track to carry heavy loads at high speeds, and methods of modernising old track for such loads and speeds.

Facing points whigh can be taken at high speeds.

Preliminary documents.

Report (Bulgaria, Egypt, Spain, France and Colonies, Greece, Italy, Portugal and Colonies, Rumania, Czechoslovakia, Turkey and Jugoslavia), by H. FLAMENT. (See *Bulletin,* December 1936, p. 1447, or special issue No. 10.)

Report (Germany, Austria, Belgium and Colony, Denmark, Finland, Hungary, Luxemburg, Norway, Netherlands and Colonies, Poland, Sweden and Switzerland), by C. LEMAIRE. (See *Bulletin,* February 1937, p. 357, or special issue No. 18.)

Report (America, Great Britain, Dominions and Colonies, China and Japan), by T. YAMADA and Y. HASHIGUCHI. (See *Bulletin,* March 1937, p. 503, or special issue No. 20.)

Special Reporter : H. FLAMENT. (See *Bulletin,* June 1937, p. 1487.)

DISCUSSION BY THE SECTION.

Meeting held on the 2nd June, 1937.

THE RIGHT HON. LORD ROCKLEY IN THE CHAIR.

— The Meeting was opened at 9.45 a.m.

The President (in French). — I will call upon Mr. FLAMENT, the *Special Reporter.*

Mr. Flament, *Special Reporter* (in French). — First of all, I wish to congratulate and thank each of my colleagues, Messrs. LEMAIRE, YAMADA and HASHIGUCHI for their valuable contributions of data, information and ideas in the three reports which I will have the honour of summing up.

The problem covered by Question I is extremely vast and complicated; it concerns three Departments, the Operating, on account of the traffic, Rolling Stock and Traction on account of the effects of the vehicles on the track, and finally the

Permanent Way on account of the problems it has to solve to deal with the traffic and running of the trains.

Each of the reports contains various information concerning at one and the same time the rolling stock, the locomotives, the permanent way on which they run, and the traffic with which it has to deal.

In my special report I summed up the principal data and the sum total of the detailed information available in this connection. This problem, like all others of the kind, comprises causes, effects and solutions.

The *causes* are known to everyone; they result from the fact that, in addition to the static problem which has been studied up to the present, there are dynamic problems which so far are little known but the effects of which are of great importance.

The *effects* : We are only just beginning, here and there, to appreciate them, and even to measure and record them.

The *solutions* are the arrangements made to ensure the necessary traffic being worked with the rolling stock available. These solutions have not always been fully explained in all the reports or by the details supplied by the various railways. During these discussions, I wish the Delegates of the railways who work the heaviest and fastest traffic over their system would explain to us, if need be, the measures taken as well as the reasons why such measures as have made it possible to work this traffic satisfactorily were taken.

In my special report I stressed the difference there is in particular between the traffic of certain North American Railways and the European Railways in the case of the loads supported by the track and the speeds utilised. I think it would be of practical value if those who have achieved such results with complete safety made known the means employed to this end.

My special report ends with the summaries I considered might logically be formulated, and these I submit for approval to the Section.

The President (in French). — Mr. Flament will now read in turn each of the Summaries from his special report.

Mr. Flament. — *Summary 1 :*

1. Except on the Railways in North America, where the axle load reaches 35 tons, the general limit is 20 tons. The tendency of the rolling stock designers at the present time is to make it 20 to 25 tons, according to the Railways concerned.

The speed of 120 km. (75 miles) and hour, the usual maximum for a long time for passenger trains, has been exceeded in many cases. The tendency at the present time is to authorize speeds of about 150 km. (93 miles) an hour for ordinary trains, and 160 km. (100 miles) an hour for railcars and rail motor trains.

Under these conditions the track stresses will henceforth include an increasing part due to the dynamic effects of the loads moving at high speeds. It is desirable, for this reason, that these dynamic effects should be investigated by means of experiments, tests and measurements in all the fields in which they may show themselves, both to guide the builders in finding suitable ways of balancing and distributing the forces, and to appreciate the stresses the track must be effectively able to stand.

The President (in French). — Does anyone wish to say anything?

Mr. Bouteloup, *Midi Railways*, France (in French). — I should like an explanation about Messrs. Yamada and Hashi-

guchi's report which gives, in Table 6, (page 215 of the Special English issue of the Report) information about « the ratio of the lateral bending stress to the vertical bending stress in the rail foot ». I want to know if these are the results of calculations or of experiments, and if, as I think, they are the latter, how the measurements have been made.

Mr. Horikoshi, *Japanese Government Railways* (in French). — They are experimental results, not calculated ones.

The President (in French). — Are there any remarks about Summary 1?

Mr. Lemaire, *Reporter*. — Mr. President, Mr. FLAMENT began by congratulating his co-reporters. I am sure the Section will be unanimous in congratulating Mr. Flament in turn. Mr. Flament has not only written a report himself, but he has also been good enough to take on the arduous and difficult task of summing up the three reports. These reports cover 300 pages in all, and I think that we in our turn should thank Mr. Flament and congratulate him on the clear and concise report which sums up the question so well.

As regards the summaries, I think the problem should be divided up. We are actually dealing with the three following questions :

1. The constructions of modern track;

2. The methods of modernising old track;

3. the way points which can be taken at high speeds, should be designed and built.

I propose therefore to begin by examining the summaries dealing with the construction of modern track, taking into account the load, and the problem of modern traction.

In his summaries, Mr. FLAMENT sums up the question by saying that there is a very marked difference between the policies pursued by European and by American Railways. If any Americans are present I should like to know the special reasons which led the New World to adopt appreciably higher axle loads than ours. I think this would be very interesting.

Mr. FLAMENT says with reason that in Europe the axle loads at present lie between the limits of 20 and 25 tons.

In view of this fact, does not the Section think it advisable to make certain recommendations, amongst others that it is desirable, as far as the track is concerned, that the load of 20 or 25 tons should not be exceeded? Here we are track technicians, and from the point of view of the track I think this limit should not be exceeded; it is up to the Traction Department to defend itself and explain why it must exceed this limit.

I would like to ask the same question and put forward the same recommendation about the maximum speed of 150 to 160 km. (93 to 100 miles) an hour. The Permanent Way Department does not wish the speed to exceed 150 or 160 km.

As Mr. Flament aptly says, very thorough theoretical and practical investigations should be made into the effect on the track of the axle loads and the speed, so as to show the fatigue conditions of modern track.

In short, as regards the first paragraphs of Mr. FLAMENT's summaries, I would like the Section to consider whether it would not be advisable to recommend that the axle load should not exceed 20 to 25 tons and the speed 150 or

160 km. in view of the conditions of fatigue of the track.

We might then examine in turn the different characteristics of the track and also see what conditions it should fulfil to meet modern railway operating requirements.

The President. — Does anyone else wish to speak?

Mr. Sherrington, *London and North Eastern Railway.* — I am not an American railway officer, but as the American engineers are not here in strength, and I have spent a long time in America, perhaps one or two words from me will be useful.

The problem, as I see it from an American operating point of view, is that the loads there are so much greater than on the Continent of Europe, because in America they are not regulated by length of platforms in the case of passenger trains, and the labour laws are such that it is more convenient and more profitable to utilise very long trains. I have read the report of each of the Reporters, and I think they have omitted to mention the fact that some of the heavier freight trains on the American railroads weigh 15 000 tons behind the locomotive. That is the maximum I think I have met. For a load of this kind, you must have a very heavy locomotive, and I think there is some bearing between the problem of the spacing of the sleepers and strength of track, also depth of ballast, that you will find on the main line of the Pennsylvania Railroad, and the weight of the axle load.

Last year I travelled on the « Hiawatha » (Chicago Milwaukee St. Paul and Pacific Railway), a very fast train which attained a speed of 102 miles per hour for eleven miles and the movement was perfect — one could write legibly on the locomotive. For this type of train the axle load is necessarily heavy, but the track is no heavier than exists in Europe.

Mr. Driessen, *Netherlands Rys.* (in French). — I think that the question raised by Mr. Lemaire as to why the weight of locomotives is less in Europe than in America can easily be answered. In my opinion it is a matter of loading gauge.

In America the loading gauge is larger than in Europe, and I think that if we used as large a gauge as the New World, our builders and engineers would not hesitate to increase the weight of our locomotives.

We, permanent way engineers, can be thankful that this is not the case, but I am sure that if it was possible to do so it would be done. This is why the weight of the rolling stock is limited to an axle load of 25 tons.

I would like to reply to another of Mr. LEMAIRE's remarks : he said he is quite satisfied with a speed of 150 km. (93 miles) an hour. I too am satisfied, but I do not think this is a question of personal preference, but rather an economic question, and the requirements of the users must be taken into account.

Mr. Miszke, *Ministry of Communications, Poland* (in French). — The American railways owned eight-wheeled goods wagons at the beginning, which explains the heavy load of the trains. On the other hand, especially in the Western districts, the system consisted of single-track lines with the stations very far apart. Afterwards automatic couplings were introduced with a tractive capacity of as much as 80 tons, which led to the construction of heavy locomotives.

As a result of certain serious acci-

dents, the law required passenger stock to be made of steel, which led to very heavy axle loads. The weight of the trains is as much as 1 500 short tons in the case of passenger trains, and 15 000 short tons in the case of goods trains. The rails, however, are not excessively heavy, except on the Pennsylvania Railroad and some other railways where rails of 152 lb. per yard (64.5 kgr./m.) are used. The use of 2 000 to 2 100 sleepers per kilometre (3 220 to 3 380 per mile) is current practice. In the Western districts where the trains are always very long, the weight of the rails is 100 lb. per yard (49.6 kgr./m.).

Dr. Müller, *Deutsche Reichsbahn* (in German). — In the case of the Deutsche Reichsbahn the following facts were observed last year. It is perhaps little known that some lines of our system are now equipped for speeds of 200 km. (125 miles) an hour. Now, the calculations we have made show that rolling loads, such as railcars, running at high speeds, require above all very careful lining up of the track both in plan and in elevation. In the case of fast railcars reaching speeds of 150 to 180 km. (93 to 112 miles) an hour, the laying of the track must be perfect. We use rails of 30, 40, 50 and 60 kgr./m. (60.5, 80.6, 100.8 and 121 lb. per yard) on wooden sleepers and a 45-cm. (17 3/4 inches) layer of ballast. The track must be perfectly horizontal in section. When such track is run over by heavy goods trains, it is these which damage it. A heavy goods train running at a low speed can make the best of a bad track, but not a railcar running at 160 to 180 km. (100 to 112 miles) an hour; the two are incompatible. For this reason in Germany we have adopted the principle of grouping the lines in two categories : express lines for high speeds and goods lines for heavy loads and low speeds. This system is already in force on some lines of the system. It is true that it cannot be applied in every case, for example between Paris and Nice. We have begun in Germany by reserving the Berlin-Elsterwerda-Dresden line for high speeds and the Berlin-Röderau-Dresden line for slow goods trains, and at the present time the division of the whole system in this way is being investigated. We also have four-track lines for separate goods and passenger trains. On other lines the goods trains have to go by a route different from that of the fast trains, unless this involves excessive detours. We have fully appreciated the difficulties involved in this system in Germany, and we have found that the fast light railcars or light trains require a track of the very highest class. But the most important question of all is this : what is the maximum speed for curves? Opinions are divided on this point. In Germany the following formula is generally used : $V = 4.5 \sqrt{R}$ (V in km./h. and R in m.) for fast railcars and $V = 4.25 \sqrt{R}$ for steam trains.

Mr. Flament (in French). — I would like to remind Dr. Müller that the reports which were drawn up on the question we are now considering include in the appended tables all the necessary data about the speeds allowed by the different railways in the case of express trains.

As regards the French Nord Railway in particular, I would like to say that we do not use any mathematical formula for calculating beforehand the speed through a curve of a given radius. We allow up to 120 km. (75 miles) an hour through curves of 500 m. (25 chains)

radius, and up to 140 km. (87 miles) an hour through curves of 800 m. (40 chains) radius.

Between 120 and 140 km. the speed is scaled according to the radius of the curves. These figures are only the maxima, as we consider that curves cannot satisfactorily be run through at high speed unless the layout is perfect, i.e. the radius absolutely constant, but also the superelevation regular and sufficient, and the transition both unto and off the curve carefully calculated and sufficiently progressive to avoid any shock to passing vehicles.

The figures I quoted above, which are the maxima allowed, must be proved in practice, and it is only after tests repeated as many times as necessary and as minute and complete as possible adjustments, that the speeds quoted above are authorised.

Mr. Bouteloup (in French). — I would like to add a few words to Mr. FLAMENT's remarks and give Dr. MÜLLER particulars of the theoretical arguments on which the French Railways have based their speed limits.

A given superelevation can balance the centrifugal force corresponding to a given speed, but not be very suitable for other speeds. Consequently a compromise has to be used.

In practice the French Railways have fixed a maximum superelevation — which is not quite the same everywhere — of 180 mm. (7 3/32 inches) on the P.O.-Midi and 200 mm. (7 7/8 inches) on the Nord. In the case of the Midi System, I have found regulations codified some 40 years ago, and which were originally as follows : a superelevation was selected which would balance the average centrifugal force of the fastest train, and the slowest, i.e. a stopped train.

I will explain this more fully : If the superelevation is taken as 180 mm. (7 3/32 inches), we found that when the train is stopped the passengers feel no discomfort, whereas the train at full speed would require 360 mm. (14 3/16 inches) of superelevation if the centrifugal force were to be completely balanced, and this is unacceptable.

In this way we got a track which stands up well to the fastest and slowest trains; the very fast train crushed the outer line of rails, and the very slow train crushed the inner line, and, generally speaking, this compromise was satisfactory.

For some years we have been electrifying our system. At the present time half the Midi Railway is electrified. Very high speeds have become the usual practice; high-speed electric traction costs less than high-speed steam traction, so that the passenger trains are generally run near the maximum speed, 100 km. (62 miles) an hour and over.

The proportional influence of the fast trains having increased, the outer line of rails underwent the most fatigue, and we had to increase the superelevation by one quarter instead of halving it. Consequently on the electrified lines the superelevation represents one quarter more than the average centrifugal force to which the track is exposed. Our superelevations which used to be calculated more or less by the formula $\frac{5.9\ V^2}{R}$ or $\frac{6\ V^2}{R}$ are based on the formula $\frac{7.5\ V^2}{R}$ on the electrified lines.

Mr. Lévi, *French State Railways* (in French). — To answer Dr. MÜLLER's question, and because I wish to contribute to the subject of the speeds admis-

sible on curves, I would like to explain the method used by the French State Railways.

For some ten years we have introduced the idea of the amount of superelevation lacking as the factor governing the allowable speed. This lack of superelevation is fixed at 150 mm. (6 inches) on curves of 500 m. (25 chains) radius or over.

The long experience of the French State Railways, whose system includes a very great number of curves, and the many tests with Hallade and Mauzin apparatus and quartz accelerographs have confirmed the value of this practice and made it possible to reach certain conclusions.

The first conclusion to be drawn from this experience is that in the case of an ordinary train a lack of superelevation of the order of 150 mm., which corresponds to 0.10 for the figures given in Mr. Lemaire's report, gives rise to no anxiety in the case of curves of 500 m. radius or more.

This insufficiency in fact does not affect the comfort, compromise the safety, nor increase to any appreciable extent the cost of maintenance.

It would even seem to be proved that if the lack of superelevation is reasonable, the behaviour of the track is better, seeing that hunting is prevented to some extent by the pressure on the outer line of rails.

A second practical conclusion is that to estimate the speed at which the superelevation becomes insufficient, calculations based on the theoretical radius of the curves are not enough, but the curvature and superelevation have to be measured throughout the whole of the curve. This has been done on the French State, where each curve is covered by a graph showing the superelevations and the versines, so that the correspondence of the superelevations and the versines can be verified absolutely on all main line curves.

A third conclusion, resulting from the previous one, is that the maximum profit can be made of a curve on condition that the curvature and the superelevation are proportional at every point, which necessitates a simultaneous examination of these two elements, thanks to the use of the versines method. With these precautions — a thorough study of the layout, and a direct comparison of the curvature and the superelevation — it has been found possible, on the State System, to allow a considerable increase in the speeds whilst obtaining a definite improvement in the behaviour of the stock on the track.

This result is an integral part of the methods adopted to correct the location. It might be of interest to point out that we have always been led, following the example given by Hallade, to end the transitions in « doucines », i.e. not only the curve of the location but the derived curves are varied gradually.

If there are no « doucines » in the transitions, experiments prove that there is some irregularity of movement, whether of coaches, locomotives, engines or railcars, and this irregularity is more noticeable and more important in its consequences than any insufficiency in the superelevation itself.

To sum up : the insufficiency of superelevation can be fairly large, about 150 mm. (6 inches), for ordinary trains, and still higher in the case of railcars provided that it has been checked throughout and the layout, as well as the superelevation, changes sufficiently gently.

Dr. Müller (in German). — In Germany the insufficiency of superelevation is 90 mm. (3' 17/32") corresponding to the formula $h = \frac{11.8\,V^2}{R} - 90$ [mm.].

Mr. Bouteloup (in French). — I would like to ask Dr. MÜLLER for some further details about a very interesting fact he mentioned, i.e. that on one of the ultra-high speed lines of the Reichsbahn, the track did not stand up well to heavy trains.

I would like to know what ill effects these heavy trains had on this track; if these were apparent in the straight or curved section; if it was a question of one line of rails sinking more than the other, or of fatigue in the fastenings. Has it been possible to make distinctions of this kind in Germany already?

Dr. Müller (in German). — From the observations we have made it appears that the alignment of the track, even in curves, is not affected to any appreciable extent by the rolling loads, but the position is very different as regards the wear of the rails, and consequently of the levelling up of the track which is badly affected by heavy slow trains, so that the maintenance work becomes very complicated and difficult. We have to go over these lines every year, whereas every three years is sufficient elsewhere. The ballast has to be packed more frequently, which is costly, and the wear of the rails is very rapid. As regards the alignment, the effect on the creep is not very important, but the action of the express trains is greater than that of the slow trains.

Mr. Couillié, *Midi Railways* (in French). — Mr. Lévi stated just now that on the French State a lack of superelevation of 150 mm. (6 inches) was the usual practice.

I find in Mr. LEMAIRE's report that the formulæ applied on many railways for the determination of the maximum speed depend on a fixed maximum lack of superelevation (90 mm. = 3 17/32" on the German railways).

In fact, for it to be run through at a given speed the superelevation on curved track should be such that that part of the centrifugal force which is not made good by the superelevation remains below a definite value.

I do not think this notion by itself is sufficient to characterise the quality of a curve and its transitions. Messrs. BAUMANN and JAEHN have already pointed this out at the Cairo Congress. They asked that another formula should be considered, which also takes into account the centrifugal force not made good by the superelevation as well as the slopes of the superelevation gradient; this formula was adopted in the Cairo proceedings.

On the Midi Railway for some years we have used a formula which more or less agrees with that of Messrs BAUMANN and JAEHN. It is based on the following facts : when running through a curve of constant radius, the passenger has no difficulty in adapting himself to a centrifugal force not compensated by the superelevation. He only has to take up a position slightly inclined to the vehicle. Once he has done this, he is just as comfortable as on the straight. The difficulty is to change from the position he is in on the straight — the normal position in relation to the floor of the vehicle — to the oblique position he has to take up on a curve if the superelevation does not exactly balance the centrifugal force.

Consequently, as soon as the transition has been reached, he has to make a certain effort, which causes him some fatigue, to keep in a satisfactory position all the time; it is this effort that has been expressed by a simple formula in which the centrifugal force, the superelevation, and the slope of the superelevation gradient as well as the radius of the curve are all factors.

We calculated the average value per second, while running through the transition, of the centrifugal force not compensated by the superelevation corresponding to the progressive change from the normal position on the straight to the balanced position on the curve. We then endeavoured to find what limit should be assigned to the value obtained in this way.

When reduced to its varying factors, this formula may be taken as :

$$\frac{p\,V}{a^2\,R}(V^2 - a^2)^2 \quad . \quad . \quad (1)$$

in which

p is the slope of the superelevation gradient;

R, the radius of the curve;

V, the actual running speed;

a, the running speed at which, on a curve of radius R, the centrifugal force is exactly compensated by the superelevation.

Using the same notations, Messrs, Baumann and Jaehn's formula may be written :

$$\frac{p\,V}{a^2}(V^2 - a^2). \quad . \quad . \quad . \quad (2)$$

and the two formulæ (1) and (2) can be related to the more general formula :

$$\frac{pV\,R}{a^2}\left(\frac{V^2 - a^2}{R}\right)^n$$

p being expressed in millimetres per metre, R in metres, V and a in km./h.; the highest limit for the formula

$$\frac{pV}{a^2\,R}(V^2 - a^2)^2$$

can in our opinion, after making many observations, be fixed at 1 000 (or perhaps at 1 200).

Several layouts on which this maximum was definitely exceeded have been altered to comply with it. The results obtained have been very satisfactory.

The President (in French). — The general discussion on Summary 1 being finished, does the Section agree to adopting it in its present form?

— *Summary 1 was unanimously adopted.*

Mr. Flament (in French). — I would like to thank Mr. LEMAIRE once more for his very kind remarks about me. I would like to recall that he wished to add to this summary the recommendation that the permanent way department should limit the tonnage of vehicles and the speeds.

Should this text be added or the recommendation be abandoned?

Mr. Ridet, *French Est Railways* (in French). — Has Mr. Lemaire drawn up a summary for our consideration? Could he do so at this meeting?

Mr. Dubus, *Principal Secretary.* — If the Section agree, we could go back to this proposal at to-morrow's meeting.

Mr. Lemaire (in French). — I merely raised the question; it is for the Meeting to decide. Mr. FLAMENT's summaries are quite sufficient but, as a permanent-way engineer, I ask if it would not be as well to state that in Europe we cannot go on increasing the axle load nor the speed.

If the Section thinks Mr. FLAMENT's summaries meet the case, I will not insist.

The President (in French). — The text of summary 1 is consequently unanimously adopted. *(Agreed.)*

Mr. Flament (in French). — I will now read the other summaries dealing with the first part of Question 1, i.e. those numbered 2 ,3, 4 and 5 in the special report.

The President (in French). — In my opinion we can examine summaries 3, 4 and 5 together.

Mr. Flament. — *Summary 2 :*

2. The heavy loads and high speeds impose upon the present-day rail metal a stress which in most cases it would be difficult to increase without affecting the behaviour and life of rails.

The weight of the rails on the most heavily loaded lines in Europe is about 50 kgr./m. (100 lb. per yard). There are still differences of opinion as to the desirability of increasing the weight of the rails to meet the increasing stress resulting from the loads and speeds.

The length of the rails and the types of rail joint vary much, according to the Railways. The conditions of use of extra-long rails are still under investigation and cannot be determined exactly at present.

Summary 3 :

3. The wooden sleeper is the most suitable for very high speeds. Increasing the sleepering is one of the methods which contribute to the strengthening of the track in order to enable it to carry the heavier loads with the least damage.

Vehicles running at high speed under satisfactory conditions as regards comfort and safety require the track to be perfectly level as well as in good alignment and correct to gauge. These conditions can only be fulfilled if the fastenings securing the rails to the sleepers are perfectly maintained and tightened up. The use of bearing plates between the rails and the sleepers, with suitable fastening devices, is the general practice on many Railways and appears desirable, at least in those parts of the track which include curves of small radius.

Summary 4 :

4. By increasing the depth of the ballast, the loads can be better distributed on the track. The ballast should be homogeneous and of good permeability, and consist of broken stone, the dimensions of which should not exceed 6 to 7 cm. (2 3/8" to 2 3/4").

The roadbed should be sound and properly drained to prevent water remaining on the ground in cases in which its permeability is known to be poor.

Summary 5 :

5. Advantage should be taken of the opportunity offered by track overhaul or renewal work, for modernising old track and obtaining the conditions stated above.

The alignment and levelling up of the track should be perfect in view of the speeds now run. Curves and their transitions should be very carefully laid, and be maintained and corrected as often as necessary.

Mr. Stoïka, *Rumanian State Railways* (in French). — In *Summary 3,* it is said in the second sentence of paragraph 1 that : « Increasing the sleepering is one of the methods which contribute to the strengthening of the track in order to enable it to carry heavier loads with the least damage. »

I think this sentence might be completed as follows : « and to give it a better resistance to the lateral forces caused by the high speeds », seeing that increasing the sleepering is of importance not only in the case of heavy loads, but also for the lateral stresses which increase with high speeds.

In addition, in *Summary 4* it says :

« By increasing the depth of the ballast, the loads can be better distributed on the track. »

I think this sentence might be changed as follows : « Increasing the depth of the ballast enables a better distribution to be

obtained of the loads and the vertical forces sustained by the track. »

Mr. Lemaire (in French). — As the various points have already been amply discussed, and in view of the lateness of the hour, I think the examination of Question I had better be continued at our meeting to-morrow.

— The Section agreed to this and the meeting ended at 12 noon.

Meeting of the 3rd June 1937.

THE RIGHT HON. LORD ROCKLEY IN THE CHAIR.

The President (in French). — Gentlemen, we will return to the discussion of Summaries 2, 3, 4 and 5 which Mr. Flament read out at the end of yesterday's meeting.

Mr. Flament (in French). — It will be remembered that Mr. STOÏKA proposed to make an addition to Summary 3, alluding to the influence of increasing the sleepering on the forces set up in the track by high speeds.

In my opinion his amendment might be completed by including the *vertical* forces as well, so that the text would then read : « ... and to offer a better resistance to the lateral and vertical forces caused by the high speeds. »

The speed in fact does not only involve a risk of deforming the track laterally, but also of deforming it vertically.

I suggest therefore adopting the text I have just read.

Then, regarding the proposed modification to the first sentence of Summary 4 tending to add the words : « and the vertical forces », I think the Section will agree to this, so that the new wording will be :

« Increasing the thickness of the layer of ballast enables a better distribution to be obtained of the loads and vertical forces sustained by the track when vehicles are passing over it. » This brings out clearly that increasing the depth of the ballast mainly has the effect of giving resistance to vertical pressures even more than closer sleepering increases the resistance to lateral pressures, by meeting the impact effects and the vertical shocks which are increased with higher speeds.

The President. — Are there any remarks?

Mr. Bouteloup (in French). — I have no objections to make about the addition suggested. I think it would be useful, however, to mention and throw light on one point brought out by the different reports : the spacing of the sleepers can be wider on lines with bull-headed rails.

The different reports show — and I am particularly anxious to get further information from our English colleagues — that in modern track on the Continent of Europe there are usually 1 500, 1 600 to 1 800 sleepers per km. (2 415, 2 575 to 2 900 sleepers per mile) on important lines.

On the other hand, according to Messrs. YAMADA and HASHIGUCHI, in England there are usually only 1 300 sleepers per km. (2 090 sleepers per mile).

I think this is due to three reasons,

and I want confirmation thereon from our colleagues.

The first reason is that in a damp climate like the British Isles, very good ballast is necessary, and therefore the well-drained superstructure stands up to the loads very well.

Secondly, I think another reason is to be found in the metal used for the rails. At the beginning the railways laying rolled bull-headed rails used a very hard steel which was not suitable for flat-bottomed rolled rails. When the metal is 10 kgr./mm² (6.35 Engl. tons per sq. in.) harder, 10 kgr./mm² breaking resistance gives about 5 kgr./mm² (3.175 Engl. tons per sq. in.) increase in the elastic limit, of which advantage could be taken as regards the loads to be carried.

Thirdly, I think that the bull-headed rail superstructure has its weight increased very advantageously by the chairs and that the sleeper with two 20-kgr. (44 lb.) chairs fastened to it has its weight increased by one third or one half, and consequently, forming as it were an anvil, is better able to resist the hammerblows from the passing wheels.

All this explains the great difference between this kind of track and that of lines laid with Vignole rails. I think, therefore, that an observation on these lines might be included in the summaries :

« It has, however, been noticed that, everything else being equal, lines with bull-headed rails require fewer sleepers than lines laid with Vignole rails. As regards the hardness of the rail, with 10 kgr./mm² higher tensile strength, there is an increase of 5 kgr./mm² in the elastic limit. »

I may add that I do not know the quality of the English rail steel.

The President (in French). — Gentlemen, I am sorry I cannot preside any longer over this meeting, as I have to be present at the Meeting of the Permanent Commission.

I will therefore give place to my colleague, SIR RALPH WEDGWOOD, Chief General Manager of the London and North Eastern Railway, actual President of the first Section.

SIR RALPH LEWIS WEDGWOOD IN THE CHAIR.

Sir Ralph Wedgwood took his seat on the platform. *(Applause.)*

The President. — Gentlemen, I thank you for your kind appreciation. I call upon Mr. WALLACE who wishes to make a statement..

Mr. Wallace, *London Midland and Scottish Railway.* — I am going to try to answer some of the questions which have been put by the previous speakers.

With regard to sleeper spacings, we have not thickened up the sleepering in Great Britain for a number of years, but so far as the London Midland and Scottish Railway is concerned, we have test lengths now in the roads with a closer spacing of the sleepers, with about 2 552 sleepers per mile as against 2 112 sleepers per mile, which has been the traditional figure for a number of years, and this will bring our sleeper spacing more in line with Continental spacings. We do not space our sleepers in Great Britain because of the quality of the rail steel.

We have some trial lengths of flat-bot-

tom rails on the London Midland and Scottish Railway, and these rails are rolled to exactly the same specification as the bull-headed rails. With regard to chairs, I would not like to claim that the use of a chair gives us a fixed end and reduces the bending moment by that amount, although I should be very pleased to think so. Unfortunately, however, the facts are against us.

Mr. Lemaire (in French). — Summaries 2, 3 and 4 having already been dealt with to some extent yesterday, I think they can be adopted without further discussion, apart from a few remarks and recommendations I want to make.

In Summary 2, Mr. Flament says that « There are still differences of opinion as to the desirability of increasing the weight of the rails... ».

I would like to hear from colleagues of the Paris-Lyon-Méditerranée who, I believe, have tested 62 or 63-kgr. (125 or 127 lb. per yard) rails, what they think, and if the use of heavier rails is to be recommended, although most European countries have adopted the standard rail of 45 to 50 kgr. (90.7 to 100.8 lb. per yard).

The question of very long rails, particularly of welded rails, is extremely interesting and has a direct bearing upon the increase of the speed, just as the constraint the rails have to be subjected to so that they can meet the thermic effects, are of the greatest importance because they are closely connected with the behaviour of the joint which is the subject of our preoccupations and represents the greatest part in our maintenance costs.

This problem has not been solved, and I would like to suggest that you recommend that it should be investigated at an Enlarged Meeting of the Permanent Commission, i.e. before the 1941 Congress, so that in two years time we can again consider the position, in all its bearings, of the question of the modern track, which is of primary importance.

As for *Summary 4*, I would like to call my colleagues' attention to the ballast question.

An increase in the speed means not only a deeper layer of ballast, but more severe acceptance tests for the ballast.

I suggest it should be stated that the ballast must be graded, homogenous, and of good permeability, and I should also like to specify an impact test before acceptance. This is already done, I believe, on the Deutsche Reichsbahn, and on the Belgian Railways. I should also like to call attention to the necessity for systematically providing closed-in locomotive ash-pans, save perhaps on systems where the electrification is completed or very nearly so, but on all those where steam traction will still be the rule for many years to come. I think the cost would be well justified.

The Belgian National Railways Company has spent 18 million francs on fitting such ash-pans, and we are completely satisfied with the results obtained. These 18 million francs in fact are thoroughly well invested. We no longer have any open ash-pans.

The result will be that the ballast will cost more on account of the severer acceptance tests, but will remain permeable much longer. It will not get clogged so quickly and therefore will meet one of the maintenance conditions of modern track : to have an ever permeable ballast.

I suggest therefore that the Section should recommend the systematic fitting of closed-in locomotive ash-pans in order to keep the ballast clean, permeable, unclogged, and consequently enable it to

play its part in the maintenance of a modern track and its requirements.

I will not deal with the length of rails as no agreement has yet been reached on this point. There is a tendency no longer to go below 15 or 18 m. (49 ft. 2 1/2 in. or 59 ft. 5/8 in.). On the Belgian Railways the standard length is 27 m. (88 ft. 7 in.); in Germany it is 30 m. (98 ft. 5 1/8 in.). There are perhaps steelworks which are still unable to get sufficiently heavy ingots to draw out sufficiently long rails.

In Belgium we have got the steelworks to agree that the rails supplied in the future shall be 27 m. long.

The President (in French). — In my opinion, the latter point could be discussed in connection with Question II.

Mr. Desaleux, *Paris-Lyon-Méditerranée Railways* (in French). — I would like in the first place to answer Mr. Lemaire's enquiry about the 62-kgr. (125 lb. per yard) rail used on the P.L.M.

For a long time our main line from Paris to Marseilles has been run over by many express trains, 23 every day in each direction, and on certain days more than double this number run between Paris and Dijon.

Four years ago, we began to lay 62-kgr. rails, the first year on a 25 km. (15.5 miles) long section the second year on a 70-km. (43.5 miles) section, the third year on 90 km. (56 miles) and last year on more than 150 km. (93 miles), so that we now have about 350 km. (217.5 miles) in service. We expect to exceed 550 km. (342 miles) at the end of this year. Consequently though our experience is not very old, it is extensive and the figures I have just quoted prove that we have found this rail, known as the « S-52 » completely satisfactory from the start. We hope to extend its use as fast as the steel works and our own resources permit.

All the engineers and all the heads of sections agree in thinking that this rail will lead to maintenance economies, and — we hope — to longer life as well as better behaviour of this track.

In the case of *Summary 5*, I suggest that the following paragraph be added, inspired by the remarks made yesterday by Mr. LEMAIRE and Dr. MÜLLER :

« The state of perfection necessary in the maintenance to enable high speeds to be used involves considerable supplementary expenditure, and this expenditure must be taken into consideration when it is proposed to use such high speeds. »

Mr. Fraser, *London and North Eastern Railway*. — Much has been said in this discussion with regard to the materials of the track, but with the exception of the last gentleman, little has been said regarding how the track is going to be maintained under more difficult conditions. It would be very interesting to me to know what steps have been taken by the different railways in regard to teaching the staff employed on the track as to what they are to do to meet the more severe conditions and the newer methods we have under review.

One of the Reporters has said that high-speed vehicles have a destructive effect on the track in proportion to the square of the speed. That means with the maximum speeds run to-day, on high-speed lines we are going to get in the future about two-thirds of the life out of our materials as compared with that obtained in the past. I am reckoning now on a speed of 90 miles per hour as

against a present maximum speed of 80 miles per hour.

The L.N.E. Railway has, so far as the line and level are concerned, adopted a system of what is called monuments or pillars in the space between the two tracks.

On the Area for which I am responsible, we have found that, even with monuments, it is difficult to maintain the track under high speeds unless the spacing of these monuments is reduced to a minimum and in several cases we have had to increase the number in order to keep the spacing smaller; but even this has not proved to be a complete remedy.

We heard a good deal yesterday about formulæ for the superelevation. It is a very good thing to have these formulæ as a guide but in my opinion it is very much better that correct alignment and superelevation should be maintained as it is only by these means that we can arrive at steady and comfortable running.

I therefore wish to suggest that before adopting this Summary No. 4, we might get some further information with regard to the newer methods in contemplation to meet the increasing difficulties of high speeds.

Mr. Ridet (in French). — Like Mr. Fraser, I certainly think that we will have to devote more and more thought to the maintenance of our high-speed lines.

I think one of the best means is the use of inspection vehicles, many of which are already in use in Germany, Switzerland, France, and I believe in America.

The use of inspection vehicles has shown us that it is very difficult to peg out a curve; the most skilled maintenance gangs do not succeed in lining up curves properly and only the use of an inspection machine makes it possible to give them all the information needed for their work.

The principal indications given by the machine are, in the opinion of some engineers, the deformation or distortion of the track, i.e. the distance between a point and the plane through three others — this is rather hard to explain — the irregularities in the curve, and depressed joints.

The value of the superelevation only comes second from our point of view, and in this respect I agree with Mr. Fraser. It is not enough to fix the superelevation; it must be maintained.

Another useful indication is the gauge of the track. The method to be followed with the inspection vehicle is to select the best maintenance gang of a section and use them to instruct the less skilled gangs.

Dr. Müller (in German). — I also should like to answer Mr. Fraser. For some years in Germany fixed reference posts (monuments) have been used on all lines run over at high speeds, even on secondary lines. These reference posts consist of pieces of rail about 1.50 m. (4ft. 11 in.) long set in concrete and must be permanently fixed. They are located every 100 m. (328 ft.) on straight sections, every 30 to 15 m. (about 98 to 49 ft.) on curves, and every 10 m. (33 ft.) on transitions.

The maintenance of the track is the principal question. Ten years ago we were still carrying out maintenance as found necessary. To-day we deal with it systematically : every line is periodically gone over every two, three of four years. The ballast is of good quality. The maintenance is more strictly carried out. We do not merely remedy existing

faults, but also those in process of formation; we work in advance of requirements, and even correct faults which might possibly arise in the future; this is what we call systematic maintenance as opposed to maintenance where visibly necessary.

We have two inspection cars by means of which we check the state of the track. I published an article about these cars in the January 1937 number of the Bulletin (French edition) (*). The great advantage of these inspection cars is that they make it possible to check the condition of the track under load, for there is a great difference between the results obtained according as the track is checked in its static state or under a rolling load. Every year we systematically go over our most important lines by means of these inspection cars, and in this way we are able to know for certain from year to year if the condition of the track has improved or deteriorated. At the same time we can decide which gang is the best, and if the head of the section is carrying out his job properly. Generally speaking, we do everything systematically. We also have a school for training our permanent-way maintenance men.

Mr. LEMAIRE spoke about the length of the rails, and the ballast. You probably know that we have a laboratory for testing stone in Germany. The stone is examined by geologists and mineralogists, not only in laboratories, but also in the quarries, and mechanical resistance, elasticity, and resistance to atmospheric reactions tests are carried out. All kinds of stone are grouped into numbered classes; No. 100 for example denotes the best quality. We have used this system for many years.

Regarding the length of rails, I would like to remark that this question has long been elucidated in Germany. We have used 30 m. (98 ft. 5 1/2 in.) long rails for the last ten years. We have about 10 000 km. (6 210 miles) of 30 m. long rails, and 1 000 km. of track laid with 60 to 2 000-m. (196 ft. 10 in. to 6 560 ft.) rails. I remember how surprised everyone was at the Madrid (1930) Congress when I said that even then we were using in Germany long rails on a large scale. This question has just been gone into in detail, and I have heard with pleasure that other railways in their turn have recognised the advantages of such rails from the point of view of maintenance, comfortable running, etc... It would take too long to relate all the advantages.

The long rails are used on sections of line in tunnels. Their use will be given up in tunnels because it costs too much to lay them, and even to take them up, especially in tunnels, where their life is shorter than in the open. The 2 000-m. long rail did not give the good results expected, because it is difficult to maintain lines in tunnels. The life of rails in tunnels, which are usually very damp, and consequently cause rust to form very quickly, is very short, and the rails have to be renewed, i.e. cut up, every 4 to 6 years, which is very costly. For this reason it has been decided that rails more than 60 m. (196 ft. 10 1/4 in.) long will not be used in tunnels in the future.

Mr. Ellson, *Southern Railway* (England). — There is one point I would make with regard to Summary 3. There is a statement made that the wooden sleeper is the most suitable for very high speeds. Unless there is a very strong objection, I do not think that the summary

(*) See *Bulletin of the Railway Congress*, English Edition, October 1937 number, p. 1986.

should remain as it is. In England we have got beyond the experimental stage in using steel sleepers. There is a good mileage now on the Southern Railway laid with steel sleepers where we certainly have maximum speeds of 75 to 80 miles per hour and where we have daily a large number of trains. I think that most of the theething troubles have been overcome. We have now some very excellent welded sleepers which give very satisfactory results. We know that they have their limitations; we know for instance that we cannot use them at present where there are track circuits or in electrified areas, but we do not know of any objection to using them from the point of view of high speed.

If they are made suitably heavy, either by increasing the weight of the individual sleepers within limitations, or by putting in more sleepers per length of rail, I attach a great deal of importance to the inertia of the track and I think that is one of the advantages which the chaired roads in England have over the flat-bottom rails. I see no reason why they should not be run over at very high speeds.

There is one other point I would like to make, namely, to day the price of timber is rising very high, and we are told that timber is getting scarcer, and therefore I think that there is, in the use of steel sleepers, a possible alternative.

Mr. Flament (in French). — In reply to Mr. Ellson I would like to say that in stating that wooden sleepers are the best for high speeds, I only voiced a preference thereby. I think this conclusion can logically be drawn from the findings, remarks and information given in the reports of my colleagues, and I think I am right in basing my opinion thereon, in particular on the practice of the Deutsche Reichsbahn.

The Reichsbahn has used metal sleepers on a large scale for a long time, but up to the present has always preferred wooden sleepers for its high-speed lines.

I might add a further remark from my own personal experience. The French Nord operates, builds and maintains the Nord-Belge Lines, and to profit by the local resources of the Belgian steel works, metal sleepers have been largely used on these lines, and in particular metal sleepers with welded bearing plates. These are sleepers for Vignole rails, not double-headed rails like those used in England.

The opinion of the Belgian Engineers, like our own, is that, for high speeds, wooden sleepers are to be preferred to metal sleepers, even when the bearing plates are welded.

This is the general conclusion that I have formulated in the text suggested for your approval.

Mr. Dubus (in French). — Perhaps we might say :

« The wooden sleeper is generally considered as being the most suitable for very high speeds. »

The President (in French). — Gentlemen, I propose to take your vote on the summaries, together with the amendment suggested in the case of Summary 3.

Mr. Dubus (in French). — It should also be remembered that Mr. Lemaire proposed to add certain recommendations. He is prepared to come to an agreement with Mr. Flament about the changes to be made in the text to take into account these recommendations which would be submitted to the Meeting

first thing to-morrow. In this way we might begin to discuss the question of points and crossings to-day.

Mr. Lévi (in French). — I would like to answer the point raised by Mr. Fraser and also suggest an addition to point 5 of Mr. FLAMENT's summaries.

It has to do with the insufficiency of superelevation admissible on curves run through at high speed.

Mr. Fraser asked just now, if I understood him rightly , if resorting to speeds at which the superelevation obtained from more or less theoretical formulæ becomes insufficient gives rise to drawbacks from the maintenance point of view.

I do not think that Mr. Fraser wanted to know if it is harder to maintain lines with curves than lines on the straight. It is a question of rolling stock, some engines behaving better on curves than on the straight and vice versa.

Nor do I think Mr. FRASER wanted to know if the methods of maintenance in use differ on curved or straight sections. In fact I think what he did want to know was : when the speed becomes such that the non-compensated centrifugal force becomes considerable in relation to the superelevation, does not the cost of maintenance also increase?

I think the answer is no, according to the very definite observations we have made in practice. On the contrary, it would appear that speeds which result in the wheels pressing permanently on the outer line of rails can only be advantageous from the point of view of the stability of the rolling stock, its behaviour on the track, and in consequence of the forces which deform the track.

Under these conditions, I do not think there would be any drawback in formulating an addition to the summaries, stating that speeds can be allowed at which the insufficiency of superelevation is as much as, for example, one tenth of the gauge, i.e. 15 cm. (6 inches), and recommending that research should be continued to find out the highest speeds allowable so long as the alignment is sufficiently correct, as stated in point 5.

Mr. Dubus (in French). — At yesterday's meeting this point of view was approved, according to the formulæ suggested by Messrs. Lemaire and Flament.

As regards the maintenance of curves, I do not think this was mentioned by the English delegates.

The President (in French). — I believe it is a question of the speed.

Mr. Dubus (in French). — Mr. Lévi, can we take it that, in your opinion, the maintenance of curves is not much more expensive?

Mr. Lévi (in French). — It is not much more expensive when the differences in superelevation to which Mr. Fraser alluded are approached.

The President (in French). — Gentlemen, are you agreed to adopt the amendments suggested by Mr. FLAMENT about wooden sleepers?

I suggest that Messrs. LEMAIRE and FLAMENT agree on the wording, taking the remarks made into account.

Mr. Lemaire (in French). — In the case of Summary 4, I suggest the following :

« The ballast should be sieved, homogeneous, and of good permeability and it

should be thoroughly tested, particularly by impact tests. »

At the end of this paragraph, I would add :

« We recommend the systematic closing of ash-pans to avoid the clogging the ballast. »

Mr. Ridet (in French). — As regards the acceptance tests for ballast, we are not in agreement. A compromise should be found.

Mr. Lemaire (in French). — The question is to know whether the majority are in agreement or not.

Mr. Ridet (in French). — I have followed the very interesting tests carried out on certain Railways to find out the resistance of the ballast to impact. I must say that this seems to depend above all on the track maintenance methods used. If tamping is used to maintain the track, the ballast must be able to resist shocks, but if shovel packing is used, there is no need for this.

An excellent ballast used in France consists of slag. Now this shows no resistance to impact tests, and would be eliminated though we can use it under excellent conditions and it gives very good results when shovel packing is used. (Dr. MÜLLER expressed his agreement with this statement.)

Mr. Wallace. — If it is cold blast slag, we can accept it, but if it is hot cold blast slag, it pulverises under the track. We *do* use shovel packing in England.

Mr. Dubus (in French). — The impact test would therefore eliminate slag.

Mr. Lemaire (in French). — I do not agree with this statement.

The President (in French). — The question of slag does not arise here.

We are now going to read out the Summaries, and we will see if anything else has to be added to them.

The President. — *Summary 2 :*

The heavy loads and high speeds impose upon the present-day rail metal a stress which in most cases it would be difficult to increase without affecting the behaviour and life of rails.

Any remarks?

— *Adopted.*

The weight of the rails on the most heavily loaded lines in Europe is about 50 kgr./m. (100 lb. per yard). There are still differences of opinion as to the desirability of increasing the weight of the rails to meet the increasing stress resulting from the loads and speeds.

Are we all agreed?

— *Adopted.*

The length of the rails and the type of rail joint vary much, according to the Railways. The conditions of use of extra long rails are still under investigation and cannot be determined exactly at present.

Are there any observations?

— *Adopted.*

We now come to Summary 3, altered as suggested by Mr. Ellson :

The wooden sleeper is at present generally considered as being the most suitable for very high speeds.

— *Adopted.*

Mr. Dubus (in French). — In the following paragraph : « Increasing the sleepering is one of the methods which contribute to the strengthening of the

track... », KAMAL EL KHISHIN BEY proposes to add :

« ... is the most economical method » or else « ... is the most economical measure contributing to the strengthening of the track ».

Kamal el Khishin Bey, *Egyptian State Railways*. — Indeed, my opinion is that the closest sleepering is the most economical.

Mr. Flament (in French). — I would like to say in this connection that the summary in this form does not agree with the three reports and the conclusions which may be drawn therefrom.

I do not think that we can state in our summaries that increasing the sleepering is the best way of strengthening the track.

Kamal el Khishin Bey. — I would like to say : « is the most economical method... »

Mr. Whiteside, *Secretary*. — I would like to point out that the English delegates do not agree with this.

Mr. Dubus (in French). — It is suggested that the wording should be : « Increasing the number of sleepers is one of the most economical methods. »

— *In view of the difference of opinion, the President put Kamal el Khishin Bey's suggestion to the vote.*

— *This proposal was rejected.*

Mr. Flament (in French). — May I remind you that in agreement with Mr. Stoïka I suggested an addition to the first paragraph, at the end of the point that has just been discussed. I agree to the following addition : « ... and to offer a better resistance to the lateral and vertical forces caused by the high speeds. »

— *Summary 3 was adopted with this addition to the first paragraph.*

The President. — We will go on to *Summary 4*.

Mr. Flament (in French). — In agreement with Mr. Stoïka, I propose to word the beginning of this summary as follows :

Increasing the thickness of the layer of ballast enables a better distribution to be obtained of the loads and vertical forces sustained by the track when vehicles are passing over it.

— *Unanimously adopted.*

The President. — Here is the rest of *Summary 4* :

The ballast should be homogeneous and of good permeability, and consist of broken stone, the dimensions of which should not exceed 6 to 7 cm. (2 3/8 in. to 2 3/4 in.).

Mr. Lemaire (in French). — Returning to my previous suggestion, I should like the wording to be : « The ballast should be *sieved*, homogeneous... »

Mr. Flament (in French). — As Special Reporter, I would agree to putting the word « sieved » if it is understood that this does not mean uniformity.

Mr. Lemaire (in French). — Sieved does not mean that, but means that the dimensions vary according to a certain scale, from 2 to 6 cm., from 2 to 7 cm. and so on...

Mr. Flament (in French). — In that case I entirely agree with my colleague, Mr. Lemaire.

The President. — Gentlemen, do you agree that the word « sieved » be added?

— *Agreed.*

Mr. Lemaire (in French). — I propose the following addition at the end of this paragraph : « Impact tests with the ballast before delivery are desirable. In order to avoid the clogging of the ballast, it is desirable that the ashpans of locomotives should be closed. »

Mr. Dubus (in French). — The French delegates do not agree.

Dr. Müller (in French). — I beg your pardon, *some* of the French delegates do not agree.

Mr. Lemaire (in French). — I suggest we say : « Tests with the ballast before delivery are desirable ».

Mr. Dubus. — Is this agreed?

Mr. Ridet (in French). — In this form, yes.

The President (in French). — Consequently we will add at the end of the first paragraph : « Tests with the ballast before delivery are desirable. »

— *Agreed.*

The second paragraph is worded as follows :

The roadbed should be sound and properly drained to prevent water remaining on the ground in cases in which its permeability is known to be poor.

— *Adopted.*

Mr. Lemaire (in French). — I suggest another addition to the end of *Summary 4* : « In order to avoid the clogging of the ballast, it is desirable that the ashpans of locomotives should be closed ».

Mr. Dubus. — Do we all agree to this addition?

Dr. Müller (in German). — I think it would be better not to mention the subject of the ash-pans, as in this case it would be necessary to go further and deal with the sand which the engine throws on the ballast, and is just as dirty.

Mr. Lemaire (in French). — On the contrary, I think this is a matter of great interest.

The President — We will vote on this addition.

— *Mr. Lemaire's addition is adopted by 14 votes to 3.*

The President. — We now come to *Summary 5*, the first paragraph of which is as follows :

Advantage should be taken of the opportunity offered by track overhaul or renewal work, for modernising old track and obtaining the conditions stated above.

— *Adopted.*

Second paragraph.

The alignment and levelling up of the track should be perfect in view of the speeds now run. Curves and their transitions should be very carefully laid, and be maintained and corrected as often as necessary.

— *Adopted.*

This second paragraph would be completed as follows :

It is desirable to determine, by suitable experiments, the limits of speeds which can be readily admitted for the passage of trains through a curve, by taking into account its radius, its superelevation or the insufficiency of this latter.

Does everyone agree to this addition?

— *Adopted.*

Mr. Dubus (in French). — I wish to remind the Meeting that Mr. DESALEUX had another suggestion to make.

Mr. Flament (in French). — At the beginning of this Meeting, Mr. DESALEUX handed me the following text which he wanted to add to the end of *Summary 5* :

The state of perfection necessary in the maintenance to enable high speeds to be used involves considerable supplementary expenditure, and this expenditure must be taken into consideration when it is proposed to use such high speeds.

As Special Reporter, I would like to remark that this addition cannot be considered as the outcome of the summaries given in the various reports, and it can only be considered as a recommendation from the Section.

— *Adopted.*

The President. — We now come to the sixth and last summary :

Summary 6 :

The angle of divergence at the point of the blade should be as small as possible; the blade should be flexible, so as to give the track a progressive curvature when entering the switch.

The radius of curvature of the part of the track connecting the switch to the crossing should be as large as possible, to guide the vehicle up to the crossing.

All causes of shock or interruption in the running surface and guiding of the axles should be avoided by a careful lay-out of the whole of the points and crossing and of the two lines of rails.

The crossing angle should be as small as possible, and the crossing, like the whole appliance, should be rigid and remain perfectly secure.

The super-elevation of the curved parts should be computed in each particular case according to the rules applying to the running road. The speeds to be allowed should be fixed and checked by tests with the various types of vehicles that have to be used.

Does everyone agree to Summary 6?

— *Summary 6 was adopted without any alteration.*

— The Meeting ended at 12.30 p.m.

DISCUSSION AT THE PLENARY MEETING

held on the 7th June 1937.

MR. HENRY-GREARD, VICE-PRESIDENT, IN THE CHAIR.
GENERAL SECRETARIES : MESSRS. P. GHILAIN, DE BOYSSON AND CAMBOURNAC.
ASSISTANT GENERAL SECRETARIES : SIR H. NIGEL GRESLEY AND DR. TH. KITTEL.

The President. — Gentlemen, to-day we have to consider the Summaries to the various Questions adopted by the different Sections.

Mr. GHILAIN, the General Secretary, will read them out to you.

Mr. Ghilain, *General Secretary.* — The text of the Summaries of Question I was published in No. 3 (4th June) of the *Daily Journal of the Session.*

(Mr. GHILAIN then read out the Summaries.)

The President. — Has anyone any remarks to make about these Summaries?

— As no objections were raised, these Summaries were adopted.

Summaries.

« 1. Except on the Railways in North « America, where the axle load reaches « 35 tons, the general limit is 20 tons. « The tendency of the rolling stock de- « signers at the present time is to make « it 20 to 25 tons, according to the Rail- « ways concerned.

« The speed of 120 km. (75 miles) an « hour, the usual maximum for a long « time for passenger trains, has been « exceeded in many cases. The tendency « at the present time is to authorise « maximum speeds of about 150 km. (93 « miles) an hour for ordinary trains, « and 160 km. (100 miles) an hour for « railcars and rail motor trains.

« Under these conditions, the track « stresses will henceforth include an in- « creasing part due to the dynamic « effects of the loads moving at high « speeds. It is desirable, for this reason, « that these dynamic effects should be « investigated by means of experiments, « tests and measurements in all the « fields in which they may show them- « selves, both to guide the builders in « finding suitable ways of balancing and « distributing the forces, and to appre- « ciate the stresses the track must be ef- « fectively able to stand.

« 2. The heavy loads and high speeds « impose upon the present-day rail me- « tal a stress which in most cases it « would be difficult to increase without « affecting the behaviour and life of « rails.

« The weight of the rails on the most « heavily loaded lines in Europe is about « 50 kgr./m. (100 lb. per yard). There « are still differences of opinion as to « the desirability of increasing the « weight of the rails to meet the increas- « ing stress resulting from the loads and « speeds.

« The length of the rails and the type « of rail joint vary much, according to « the Railways. The conditions of use of « extra long rails are still under investi- « gation and cannot be determined exact- « ly at present.

« 3. The wooden sleeper is at present « generally considered as being the most « suitable for very high speeds.

« Increasing the sleepering is one of « the methods which contribute to the « strengthening of the track in order to « enable it to carry the heavier loads

« with the least damage, and to offer a « better resistance to the lateral and ver- « tical forces caused by the high speeds.

« Vehicles running at high speed un- « der satisfactory conditions as regards « comfort and safety require the track « to be perfectly level as well as in good « alignment, and correct to gauge. « These conditions can only be fulfilled « if the fastenings securing the rails to « the sleepers are perfectly maintained « and tightened up. The use of bearing « plates between the rails and the slee- « pers, with suitable fastening devices, « is the general practice on many rail- « ways, and appears desirable, at least in « those parts of the track which include « curves of small radius.

« 4. Increasing the thickness of the « layer of ballast enables a better distribu- « tion to be obtained of the loads and « vertical forces sustained by the track « when vehicles are passing over it.

« The ballast should be sieved, homo- « geneous and of good permeability, and « consist of broken stone, the dimen- « sions of which should not exceed 6 to « 7 cm. (2 3/8″ to 2 3/4″). Tests with « the ballast before delivery are desi- « rable.

« The roadbed should be sound and « properly drained to prevent water re- « maining on the ground in cases in « which its permeability is known to be « poor.

« In order to avoid the clogging of the « ballast, it is desirable that the ashpans « of locomotives shoud be closed.

« 5. Advantage should be taken of the « opportunity offered by track overhaul « or renewal work, for modernising old « track and obtaining the conditions « stated above.

« The alignment and levelling up of the « track should be perfect in view of the « speeds now run. Curves and their « transitions should be very carefully « laid, and be maintained and corrected « as often as necessary.

« It is desirable to determine, by sui- « table experiments, the limits of speeds « which can be readily admitted for the « passage of trains through a curve, by « taking into account its radius, its su- « perelevation or the insufficiency of « this latter.

« The state of perfection necessary in « the maintenance to enable high speeds « to be used involves considerable sup- « plementary expenditure, and this ex- « penditure must be taken into conside- « ration when it is proposed to use such « high speeds.

« 6. The angle of divergence at the point « of the blade should be as small as pos- « sible; the blade should be flexible, so « as to give the track a progressive cur- « vature when entering the switch.

« The radius of curvature of the part « of the track connecting the switch to « the crossing should be as large as pos- « sible, to guide the vehicle up to the « crossing.

« All causes of shock or interruption « in the running surface and guiding « of the axles should be avoided by a « careful lay-out of the whole of the « points and crossing and of the two li- « nes of rails.

« The crossing angle should be as « small as possible, and the crossing, like « the whole appliance, should be rigid « and remain perfectly secure.

« The super-elevation of the curved « parts should be computed in each par- « ticular case, according to the rules ap- « plying to the running road. The speeds « to be allowed should be fixed and « checked by tests with the various types « of vehicles that have to be used. »

[621. 592 & 625. 143]

QUESTION II.

Application of welding :

1. To obtain extra-long rails;

2. In manufacturing and repairing points and crossings.

(a) Results obtained by using extra-long rails. Methods used to ensure safe expansion of the rails and anchoring of the track.

(b) Technical and financial results shown by welding points and crossings.

Preliminary documents.

Report (Germany, Belgium and Colony, Luxemburg, Netherlands and Colonies, Denmark, Norway, Sweden, Finland, Poland, Austria, Hungary, Switzerland), by Dr.-Ing. MÜLLER. (See *Bulletin*, November 1936, p. 1239, or special issue No. 8)

Report (Great Britain, Dominions and Colonies, America, China, Japan), by George ELLSON. (See *Bulletin*, January 1937, p. 1, or special issue No. 13.)

Report (France and Colonies, Spain, Portugal and Colonies, Italy, Czechoslovakia, Bulgaria, Rumania, Jugoslavia, Greece, Turkey, Egypt), by J. RIDET. (See *Bulletin*, January 1937, p. 171, or special issue, No. 16.)

Supplement to Report (Italy), by J. RIDET. (See *Bulletin*, May 1937, p. 1485.)

Special Reporter : Dr.-Ing. MÜLLER. (See *Bulletin*, June 1937, p. 1494.)

DISCUSSION BY THE SECTION.

Meeting held on June 4th, 1937.

SIR RALPH LEWIS WEDGWOOD IN THE CHAIR.

— The meeting opened at 9.30 a.m.

The President. — Gentlemen, to-day we will discuss Question II.

I call on Dr.-Ing. MÜLLER, the *Special Reporter*.

Dr. Müller, *Special Reporter* (in German). — First of all I must thank my colleagues for the valuable contribution they made to my special report by the investigations and information contained in their individual reports.

Dr. Müller then read the summary included in his *special report*, and went on to say :

Before we go on to the summaries I was able to draw up, I would like to ask

a few questions, especially about welding, a subject about which I found the reports were not unanimous.

I want to know, in particular, if the Belgian National Light Railways Company intends to continue welding fish-plates by fillet welding, in spite of the fact that 15 % of the rails break?

Mr. **Dubus**, *Principal Secretary*. — Is there any delegate of the Belgian National Light Railways Company present, who can give Dr. Müller the information he wants?

Mr. **Valcke**, *Belgian National Light Railways Company* (in French). — The great number of breakages on our system is due above all to the fact that different welding methods have been used.

Originally we had not discovered a completely homogeneous and regular method of welding, such as that now used.

At first we only welded the fish-plates. Then, in view of the many failures in welded joints, we welded not only the fish-plates but also the bearing plates under the foot of the rails.

At present we are regularly fabricating rails of a certain length by electric welding, up to 50 and 60 m. (164' 1/2" and 196' 10 1/4"). These welds nearly always include the fitting of a bearing plate under the joint. Continuous fillet welding assures the solidarity of this plate with the foot of the rail.

The fish-plates are fastened by spot welding.

A V-shaped cut is made in the rail head in line with the joint and the groove filled with the welding metal.

Since this method was introduced, there have been far fewer defective joints. I might add in explanation of the rather high number of defects, that we only use electric welding on worn rails.

Welding in the four-foot and six-foot is generally done by the thermit method on the electrified system, and electric welding is only used on worn rails. For the last two years, however, electric welding has been used on lines worked with steam trains and railcars, the current being supplied by small generating sets.

These welds are made on the smaller types of rails; these rails only weigh 23 kgr. per metre (46.4 lb. per yard).

The welding of track used exclusively for steam traction and railcar services is a rather difficult matter, since we have to weld rails that are already 25, 30 or even 40 years old. Naturally these rails are not run over at very high speeds. The object in view has been to remedy defective joints when the rest of the rail was still in good condition. Such defects were the more serious that these lines were laid with 9-m. (29' 6 3/8") long rails, this being our standard rail some years ago. The present length is generally 12 m. (39' 4 1/2") in the case of 23 kgr. per m. (46.4 lb. per yard) rails. We hope by the use of welding to increase the life of the track, improve the comfort, and reduce rolling stock maintenance.

As the cost of making such joints is relatively low, the fact that there are a certain number of failures — there are very few breakages, but rather local loosening of the welding fillets — does not upset us unduly, since the ordinary permanent way men make good such defects with the help of a small equipment. The percentage of defective joints is now reasonably low; it certainly does not exceed 3 to 4 %.

Mr. **Dubus** (in French). — If I re-

member rightly you have rails up to 60 m. (196' 10 1/4") in length, dont you?

Mr. Valcke. — Yes, to be accurate up to 54 m. (177' 2"), a length obtained by welding in situ.

Mr. Schutz, *Sectional Secretary* (in French). — Dr. MÜLLER asked me to still put the following question to the Belgian Light Railways' delegate : Does this railway intend to go on using welding in spite of the 3 to 4 % of breakages, which Dr. MÜLLER considers rather a high figure.

Mr. Valcke (in French). — We continue to use welding, but not on a large scale.

At the present time we have 4 separate welding plants, especially in the hilly parts of the country.

We are also beginning to use autogeneous welding. This has already been tried on the electrified lines, but the results were not very satisfactory. It appears, however, that the firms concerned have made much progress lately, and we are soon going to weld rails experimentally on track used exclusively by electric trains.

Mr. Dubus (in French). — Are you proposing to make these welds on a fairly large scale?

Mr. Valcke (in French). — No. It will rather be an experiment.

Mr. Dubus (in French). — How long have you kept statistics of the percentage of breakages in question?

Mr. Valcke (in French). — We have used electric welding for more than 10 years. I think that the percentages given relate to all the electric welds made on all classes of line.

Mr. Ridet, *Reporter* (in French). — So that at the beginning the percentage was 15 %, wasn't it?

Mr. Dubus (in French). — And now it is 4 %. How long is it since the number of failures was reduced to this figure?

Mr. Valcke (in French). — Since we introduced improved methods, but I cannot give you any exact information. I think it is during the last four years.

Mr. Schutz (in French). — And the percentage of 4 %?

Mr. Valcke (in French). — That is the present figure. The high percentage of failures was mainly found at the beginning owing to the bad methods used. I want to insist once more that it was not a question of rail breakages, but of loosening of the welds. Naturally we never had 15 % of broken joints, but only of loosened joints.

Dr. Müller (in German). — I would like to know how many broken rails there are on the other railways. In Germany welds have been made for the last 10 years, and the proportion of breakages is about 1 out of a thousand with thermit welding, and 0.2 per thousand with electric butt welding. As regards the question of welding old or new rails, I may state that in Germany, old rails are welded rather than new ones; the reason is that the rolling mills have been supplying 30-m. (98' 5 1/8") rails for a long time. At the present time they can supply us with 60-m. (196' 10 1/4") rails. Perhaps you would be interested to know how we weld small lengths of rails. Originally we cut off the ends of old 9, 10 or 12 m. (29' 6 3/8", 32' 9 3/4" or 39' 4 1/2") rails, which gave us sec-

tions of varying lengths, which was not recommendable. In order to get uniform lengths, for the last year we have adopted the practice of welding the old rails into long indeterminate lengths and then cutting them into given lengths, so that we now use uniform lengths of 20 m. (65' 7 3/8") on old track of secondary importance. For this purpose, the lines are divided into three categories : the first category includes track for express services; the two others are the secondary lines and the small lines. It is furthermore a very good practice only to use rails of given lengths, so that the joints occur at regular intervals. The rails on lines in the first category are 30 to 60 m. (98' 5 1/8" to 196' 10 1/4") long. On the least important lines we use the short rails and old rails.

Mr. Ridet (in French). — In reply to Dr. MÜLLER, I would like to say that in France also worn rails are often welded. In fact, welding is chiefly used for this purpose.

There is no such difference in length in the rails we use on the running road as that in the figures quoted by our German colleague, 9, 10 and 12 m., but I would like to explain our current practice in some detail.

For example on the French Est we have some old 12-m. (39' 4 1/2") rails which have been in service for as long as 40 years. We cut off 50 cm. (1' 7 11/16") at each end, so that the rail is only 11 m. (36' 1") long, and we weld two such rails together end to end by electric welding. In this way we get 22-m. (72' 2") long old rails which give excellent service, especially when annealed. Rails that have been annealed in this way are even better than the original rails which had become cold-worked by the rolling loads. To sum up, I am absolutely in agreement with Dr. MÜLLER in what he said about welding worn rails.

Mr. Lemaire, *Belgian National Railways Company* (in French). — It is very reassuring to find that the railways of great countries like Germany and France are more or less unanimous on such an important question as that of long welded rails. In Belgium, a little country whose railway system is only about one tenth the size of those of these countries, we are also of this opinion.

Our rails are usually rolled in 27-m. (88' 7") lengths, because we have always made use of multiples of 9. Originally our rails were 9 m. (29' 6 3/8") long; then we increased the length to 18 and 27 m. In our shops we weld two 27-m. long rails which gives us 54 m. (177' 2") long rails. We have laid the electrified Brussels-Antwerp line with 54-m. lengths obtained by welding together two 27-m. rails.

The gap left between the joints presupposes a certain constraint in the rail. The fastening by means of coachscrews has been replaced by clips on bearing plates, completed by isolated anti-creep devices.

We follow the same practice in the case of worn rails, but we cut off the damaged ends in a systematic fashion, so as to get usable rails for more or less secondary lines; these rails are usually 35 m. (114' 10") instead of 36 m. (118' 1 1/4") long.

We also weld together four shortened 9-m. (29' 6 3/8") rails, of Bessemer steel, dating from 1879, which still showed practically no signs of wear. After testing the welds, we annealed the rails as we found a change in the texture of the

metal. We anneal our rails and carry out on them not only metallographic tests, but also vibratory bend tests. We have some rails under test at the University of Liége, which have already undergone 3 million impacts.

We have also tested what we call the ideal joint. I must explain what I mean. Whatever precautions are taken in rolling the fish-plates and the rails themselves, it is very difficult to get two fishing spaces which are absolutely identical, seeing that the two rails which are being assembled obviously did not follow each other out of the rolling mill. There are certain fabrication tolerances; one end of the rail may have a tolerance of more than 1 mm. (0.039") and the other of less than 1 mm. The result is that the fishing is imperfect from the start.

To remedy this we sawed an 18-m. long rail in two. We fish-plated the two identical ends. An 18-m. rail has then been welded to each half, so that we have two standard 27-m. rails, and we call this the ideal joint, because it really is ideal. On this trial section of track it is impossible to say where the joint is. It is impossible to say where either the welded or fished joint is.

This is a very interesting test, which I have already pointed out to my French railway colleagues. *A priori* it may seem a very strong measure systematically to saw a rail, a new rail, in two and fish it. But in this way we are sure that the fishing is perfect from the beginning, and since there is no play, it seems likely that it will be a long time before there is any wear.

We have laid several kilometres of track fished in this way, and we are very satisfied with the results. Perhaps this is a solution to the problem; it is certainly an improvement.

Mr. Cooper, *London Passenger Transport Board*. — There are one or two features in this very interesting paper that Dr. MÜLLER has summarised on which I should like to have some additional information. The first point is to what extent can expansion be ignored. Dr. MÜLLER in his summary refers to rails of a length of 100 feet and 200 feet being generally used on the Continent. On the London Transport Board Lines we have a number of rails 240 feet long. Our experience is that movement or expansion effect only takes place towards the end of those rails, and that no movement, or appreciable movement, takes place over the greater length, and in consequence, in arranging the gaps at the ends of the rails, a gap is only put in which is normally sufficient for a 60-foot rail. Dr. MÜLLER in his summary has referred to the continuous lengths that have been put in in America. It would appear, therefore, that so long as one has a very well-maintained track, expansion effects are taken up by internal stress in the rail. One, therefore, is a little curious to know as to why the 100 to 200-foot lengths on the Continent are more or less fixed, and I should like very much to know whether it is the intention of the engineers to gradually increase this dimension, and whether it is only the natural caution of railwaymen which so far has kept the lengths down to the amount which has been mentioned.

The second point on which I should like to have some information is what standard of strength and what factor of safety is going to be required for a welded joint. It is the English practice, so far as rail strengths and rail specifications are concerned, to require a tup test, and so far with the various classes of weld which we have tried, in many cases

experimentally in London, no joint of any type can withstand the tup test that we consider is necessary so far as the ordinary rail is concerned. I believe that on the Continent more attention is given to the bend test, and in the bend tests which we have carried out in London it happens that the welded joint more approximately meets or shows the results of the ordinary rail than obtains with a tup test. It is therefore a question, I think, with English engineers in particular, as to whether our views are going to change so far as requiring a very severe tup test with welded joints.

So far as our results indicate, it would appear that it is the resistance on butt weld that, with our conditions in England, gives the best results. With particular reference to our tunnels, and where long lengths of rail are required, so far we have gone to 1 500 feet, the resistance weld requires to be carried out at a depot, and so far we are not facing the transport of rails longer than 300 feet. I am therefore particularly interested in a reference made in Dr. MÜLLER's summary to a statement that the Delaware and Hudson Railroad have developed a machine with which the resistance welding can be carried out on the site, and perhaps I could obtain some information with regard to this machine, and how it is built.

I referred just now to the strength of the rails, and perhaps, as the result of a railwayman's caution, we have adopted a rather softer rail for electric welding and thermit welding in order to add to the security of the rail. I anticipate that with the general use of resistance welding, one can still use as hard rails as is our custom for a very heavy service.

Mr. Ellson, *Reporter*. — It should be understood that the practice just mentioned by Mr. COOPER is that of the London Passenger Transport Board, and is not the general practice in England.

Dr. Müller (in German). — In reply to Mr. COOPER, I would like to say that the question of the joint gap is extremely complicated. The observations made are everywhere in agreement : the rails only expand at the ends. Consequently the question arises as to what lengths can we go in making long rails. Are certain railways proposing to weld rails into continuous lengths of 20 to 40 km. (12 1/2 to 25 miles)? In Germany we have made tests in which the temperature of the rails was artificially raised to 100° C. (212° F.) and we have gone into the question very closely. We succeeded in heating rails electrically to a temperature of 180° C. (354° F.) by passing very-low tension current through them in large amounts, and only at 180° C. is there any deformation in the track. We have also made trials to find the best type of rail fastening. I cannot give you any details on this subject, it would take too long. I will merely say that we have studied this question very thoroughly when heating the rails artificially.

It was also asked whether we proposed in Germany to make our rails much longer. We think that the maximum has been reached with 60 m. (196' 10 1/4"), first of all for practical reasons, and secondly because we have found that the length of the rails has a certain influence on the running of the stock. We have found that vibrations occur at very high speeds (120 to 140 km. = 75 to 87 miles an hour). We have found that each vehicle has a critical maximum speed after which it begins to oscillate. These are horizontal vibrations which we call pitching vibra-

tions; they only occur at high speeds. In addition we found that the rail joint can play an important part in remedying this defect; naturally it must not be a defective joint. A good joint damps out these vibrations. It is impossible to prevent such vibrations being set up on a long section of track run over at high speed, so that it is a very good thing to have a joint to break them up. At low speeds, like on tramways, there are no such vibrations. Consequently it is not merely for practical reasons, but also to avoid the persistence of such vibrations that we are not likely to exceed a length of 60 m.

I would now like to ask Mr. Lemaire if he thinks it would be profitable to go any further in the case of welded joints.

A third question is that of annealing. We have not found this necessary in Germany, but from what I have read, some railways seem to think it a good thing to anneal welded rails.

Do any Railways intend to fabricate rails of infinite lengths, or does everyone agree with us that there should be a limit set to the length of rails? In Germany there is such a limit, based on experience, and this maximum length is 60 m. I would be very interested if someone would supply information on this question.

Mr. Ellson. — It is a most interesting account of the experiment which Dr. Müller has carried out. Would he give us a little further information regarding the construction of the track, namely, what was the nature of the ballast, the weight of the rails, and the number of sleepers per rail length?

I think it would be very useful to know that, because it would give us an idea of the inertia of the track, to which I have just referred. There must be a tendency, at any rate with a bull-headed rail in England, to lateral distortion. On the Continent, the rails are flat-bottomed, and they have a greater resistance to lateral distortion. But I should like to have some further information so as to enable us to make a comparison of the dead-weight of the track in that experiment as compared with our standard weight in England.

Dr. Müller (in German). — Many tests have been made at Karlsruhe, over a long period, both on the running line and in the stations, as well as on a special testing plant 45 m. (147' 7 3/4") long. These tests were made with all sorts of sleepers, both wood and steel, and with straight and curved sections of track. In these tests, which we ourselves carried out, we used high-quality broken stone giving an elastic ballast like on the best track (like basalt). The weight of our standard rails is 49 kgr./m. (98.6 lb. per yard). There are 1 600 sleepers per kilometre (2 574 per mile).

We have tried out other kinds of sleepers on the test plant, for example those made of wood with metal fittings and wedges, etc. We found that on straight sections deformations started at a temperature of 180° C. (354° F.), and on curves of 500 m. (25 chains) radius, at 130° C. (266° F.). It is well known that straight sections are less likely to get out of line than curves.

If anyone present ever pays a visit to Karlsruhe, I shall be very pleased to show him anything that may interest him.

Kamal el Khishin Bey, *Egyptian State Railways.* — Two years ago, we started our experiments in Egypt with welding a

full length of 1 kilometre in situ on a running line carrying suburban traffic, and where the speed is about 80 km. (50 miles) per hour. At the beginning we left only an ordinary joint at the two ends of the kilometre length, but we soon noticed that the joint was closed, and then we made a bigger joint of about 50 mm. (2"), realising this by two blades that we used to get at the ends of the bridges. The observations made on that joint shewed that it never closed to 50 mm., but only went up to 40 mm. (1 9/16").

I think I ought to say that our rails are 12 m. (39' 4 1/2") long and laid on steel sleepers, that the maintenance of this kilometre length has given no trouble, and that the running is very smooth on this particular length.

The President (in French). — Can any Member reply to Dr. MÜLLER's question regarding the annealing of welds?

Mr. Stoïka, *Rumanian State Railways* (in French). — On our System we have only used welding experimentally. Amongst other things, we welded a kilometre of track in a tunnel where there are fifty degrees C. of variation in temperature at the ends and twenty degrees in the middle.

The only expansion of the track observed was limited to 3 cm. (1 3/16") down and 1 cm. (13/32") beyond. The thermit process was used, and great care was taken to make the welds properly.

In this connection, Dr. MÜLLER pointed out in his report that rail breakages can nearly always be attributed to defective work in making the weld, especially in the case of the first sections dealt with. Now, in spite of the fact that our welds were made very carefully, we had 10 % of breakages in the neighbourhood of the welds. There were 15 breakages out of a total of 150 joints. In view of this bad result, we made thorough investigations and found — like Mr. RIDET says in his report — that there is a change in the grain of the metal which makes it weaker in the neighbourhood of the joint, and this causes the rail to break. We found the strength of the metal was reduced by about 25 %. The rails in question were made of Thomas steel, with a strength of 80 kgr./mm^2 (50.8 Engl. tons per sq. in.) which was reduced to 60 kgr./mm^2 (38.1 Engl. tons per sq. in.) near the weld.

I would like to ask Dr. MÜLLER if he thinks this was accidental, or if the same facts have been observed on the German Railways?

Dr. Müller (in German). — This is precisely what I mean by « childhood weaknesses ». We found the proportion of breakages was about one out of 1 500 joints. Mr. STOÏKA states that on his railway there were 15 breakages out of 150 joints. The fault must lie with the firm carrying out the welding, or be due to defective workmanship.

Mr. Stoïka (in French). — I would like to say once more that the breakage was not in the weld itself, but near the weld.

Mr. Stehlik, *Jugoslav State Railways* (in German). — I quite agree with Dr. MÜLLER. On our System, we welded a 1 200-m. (3 937') length in a 1 800 m. (5 928') long tunnel, on a curve of 300 m. (15 chains) radius. The welding of the rails in this tunnel dates back to 1933; the thermit process was used, and we have not had a single breakage. Our ex-

perience agrees with that of the Deutsche Reichsbahn. I might add that the welds were made by our own men. They were merely given the necessary instructions beforehand by the firm concerned. The rails used are 45 kgr./m. (90.6 lb. per yard) on wood sleepers. The tunnel is on a steep gradient (about 1 in 50) on the Adriatic coast, and is only single-track. The results obtained are excellent.

Dr. Müller (in German). — Up to date we have made 400 000 welds by the thermit process, and have had more than 500 breakages, i.e. about 1 per thousand; in the case of electric welds there have been about 0.1 per thousand breakages, with about 600 000 welds.

I would like to remind you of the second question I asked. Do some Railways consider that heat treatment of the welded part after welding gives improved results?

According to the experiments made by the German Reichsbahn, if the thermit or resistance weld is properly made, the weld is already perfect, so that further heat treatment is of no advantage.

Mr. Cooper. — I suggest that it would be unwise to make too definite a statement against heat treatment. It is my view that in some cases annealing is beneficial.

Mr. Ridet (in French). — I think that annealing improves the quality of the weld by making the grain finer and the metal more homogeneous.

I also think that this annealing need not be very costly as it can be carried out with a petrol blow-lamp or in a furnace heated by oil or electrically. In any case, welds made by the thermit process, when the work is properly done, give very satisfactory results.

This explains why several Railways do not find annealing profitable, while others who have carried it out systematically have obtained good results.

In any case I think that annealing improves the quality of the weld.

Dr. Müller (in German). — I am grateful to Mr. RIDET for the data he has just given us.

The President (in French). — As it is rather late, I suggest, Gentlemen, that a vote be taken on the first summary, which Dr. MÜLLER will now read out.

Dr. Müller (in German). — *Summary 1 :*

1. The application of welding to track equipment, which only dates back about 6 years, has not only given rise, in spite of its recent introduction, to constructional progress, but, as shown by the results obtained so far, has been the means of effecting appreciable savings in the first cost and maintenance costs of the track.

The chief advantage of welding is that the number of rail joints can be markedly reduced, and that the joints can even be entirely eliminated on long track lengths.

It is desirable that studies and experiments be carried on in connection with the behaviour of extra-long welded rails under the rolling loads, as well as the width of the joint gap with different lengths, at different rail temperatures. First of all, the exact causes of track deformations, which sometimes occur, should be investigated.

On the other hand, not only is smooth and comfortable riding obtained by the use of extra-long rails, but there is also less wear and tear of the rolling stock. Consequently savings in the first cost and maintenance of rolling stock may be expected, such savings being the larger the longer the section of line laid with long rails.

The President (in French). — Are there any remarks?

Mr. Ridet (in French). — To the second paragraph : « The chief advantage »... I would like to add after the first sentence : « Moreover, welding enables composite rails to be constituted by welding together two rails of different profiles, which is an excellent means of abolishing special fish-plates, which fish-plates often are a cause of dislocation. »

Dr. Müller (in German). — I agree.

The President (in French). — Is the Meeting agreed on the addition suggested by Mr. Ridet?

— *Adopted.*

Mr. Ridet (in French). — Here is a second addition I suggest might be inserted after the fourth sentence in paragraph 2 of this summary :

« On metal bridges, the welding of joints is easier than in the ordinary track, seeing that the structure expands at the same time as the rails and that there are generally expansion devices at the ends. Such welding appreciably diminishes the dynamic effects, which contributes to the preservation of the whole of the different parts of the structure ».

— On Dr. MÜLLER's suggestion, this addition was re-worded as follows : « On bridges, the welding of the joints appreciably diminishes the dynamic effects, which contributes to the preservation of the whole of the different parts of the structures. »

The President (in French). — Are there any remarks?

— *This addition was adopted.*

Mr. Ridet (in French). — I should also like to add the following paragraph :

« The use of welded rails is particularly recommendable for heavily loaded sidings when the ballast and side-ballast are compact and well knitted together, as the risks of transverse deformation are thus very much reduced ».

Mr. Dubus (in French). — What do you mean by « sidings »?

Mr. Ridet (in French). — Shunting lines.

Mr. Dubus (in French). — When you use the expression « side ballast » are we to understand that this generally means the ballast in the six-foot?

Mr. Ridet (in French). — Yes, I mean in the six-foot.

Dr. Müller (in German). — In my opinion, the last sentence is much the most important. The use of long rails in sidings is particularly advantageous, because on these lines the ballast is very dirty and forms a compact whole, so that deformation of the track transversely is less likely. I suggest we say : « for heavily loaded lines in marshalling yards... ».

Mr. Ellson. — I wish to state that such practice would not prove economical in sidings; the opposite is true as regards running roads, wherein part of the expenditure on electrical bonds can be avoided in the case of electrified track.

In the case of marshalling sidings, rather heavy expenditure might be entailed which would not be justified.

Mr. Ridet (in French). — I said : « ... for heavily-loaded lines... ».

The President (in French). — We might say : « should be considered » instead of : « is particularly recommendable ».

Mr. Ridet (in French). — That's it. I agree to that.

Dr. Müller (in German). — I also agree that this practice would be too expensive on accessory lines, and is to be recommended above all on the most important lines.

— The addition proposed by Mr. Ridet was given the following form :

« Similarly, the use of welded rails should be considered for heavily loaded lines in marshalling yards when the ballast and side-ballast are compact and well knitted together, as the risks of transverse deformation are thus very much reduced. »

The President (in French). — We have thus concluded the discussion of *Summary 1*. The Bureau of the Section will be requested to arrange the wording adopted, including in it the three additions suggested by Mr. Ridet.

— *The Section expressed its agreement with this.*

— The Meeting ended at 12.55 p. m.

Meeting held on June 8th, 1937.

SIR RALPH LEWIS WEDGWOOD IN THE CHAIR.

— The meeting began at 9.30 a.m.

The President (in French). — Gentlemen, we will now proceed with the discussion on the summaries of Question II.

Mr. Ridet (in French). — I would like to make another addition, at the end of *Summary 1* adopted at yesterday's meeting, namely the following sentence :
« It is desirable that the welding of rails should be checked during execution, by means of suitable tests (mechanical and metallographic) ».

The President. — Is this agreed?

— *This addition was adopted.*

We will now go on to Summary 2.

2. By the use of welding for joining and fastening rails and other track components, particularly when fabricating points and crossings, it is possible to reduce the number of fastenings subject to heavy wear. The resistance to wear and the life of points and crossings will be increased thereby.

Dr. Müller (in German). — The method used by the Deutsche Reichsbahn to recondition metal sleepers is, in my opinion, very economical; broken or worn sleepers are repaired in two ways. Bearing plates can be welded to the sleepers themselves; unfortunately this process has the drawback that the sleepers must still be in good condition; if they are cracked on the sides, the work cannot be done. For this reason we have used another process for 12 to 13 years : we cut out the usable middle portions of worn sleepers and weld them together. This process is relatively cheap, and gives, so to speak, new sleepers. The cost of a

weld of this kind is about 15 % of the cost of a new sleeper, and the reconditioned sleeper lasts nearly as long as a new sleeper. It is a very good way of increasing the life of sleepers by many years. If anyone wants any additional information on this subject, I shall be very pleased to answer any questions.

Mr. Ellson. — Could Dr. MÜLLER say what is the life of a steel sleeper? They have used them for many years in Germany, and it would be very interesting to know what is the serviceable life of a steel sleeper. In England, we are now using steel sleepers to an increasing extent, and it would be very helpful to know on what length of life we could base our possible economies.

Dr. Müller (in German). — The life of metal sleepers depends first of all on the district where they are used. On the average it can be taken as 30 to 40 years. But there are also districts where the metal sleepers only last 8 to 12 years; this is the case, for example, in the Ruhr Valley where there are the steel works of our contractors and the atmosphere is heavily laden with sulphuric acid fumes. It used to be maintained that metal sleepers should be used near to their place of manufacture to save transport costs; this was a serious mistake. On the Deutsche Reichsbahn, just as we group the track into three categories, we make a distinction between districts where wood and where steel sleepers have to be used. In damp regions, in tunnels, near steel works and chemical works, we only use wood sleepers. In the Ruhr, for example, 8 000 tons of sleeper metal was lost through corrosion. For the same reason the use of metal sleepers has been proscribed in the Essen district. On the other hand, in the agricultural districts where the metal sleepers last indefinitely, we use them. After 40 years they are still as good as new. Formerly in such regions, for example on the Russian frontier, near Poland and Lithuania, where there were vast forests, only wood sleepers were used. But after many sleepers had been damaged by a fungus which destroyed the inside of the sleeper, we were obliged to use only metal sleepers here also in spite of the cost of transport. Besides, the results are quite satisfactory.

I can therefore only recommend the welding of sleepers and their use on lines of secondary importance.

Mr. Lecoanet, *Algerian Railways (Joint Working)* (in French). — I would like to ask Dr. MÜLLER if he thinks metal sleepers deterioriate for other reasons besides climatic conditions or heavy traffic, and in particular if he agrees that there is a critical speed which should not be exceeded with metal sleepers.

It is generally admitted — I have been told so on several occasions by Engineers of various Railways — that metal sleepers deteriorate very quickly if the speed exceeds 100 km. (62 miles) an hour.

Is this statement accurate?

We use a great many metal sleepers in Algeria. We are now introducing speeds of over 120 km. (75 miles) an hour, and we want to know if this is going to shorten the life of our metal sleepers very quickly.

Dr. Müller (in German). — In my opinion the speed has no effect.

Kamal el Khishin Bey. — We also use in Egypt steel sleepers since 1910, and I agree with the words of Dr. MÜLLER that it is humidity that attacks the steel sleeper. Steel sleepers in Upper Egypt, where it scarcely ever rains, have lasted

for about 26 years, but in Lower Egypt, in the damp places, they last for about nine years.

The President. — Gentlemen, this question of metal sleepers it somewhat outside the scope of the business on hand, which is the question of welding.

Mr. Andrzewski, *Polish State Railways* (in German). — A good deal has been said about the welding of rails and sleepers, but what interests me above all is the way of carrying out this work. When is the work done in situ and when in the shops? I admit electric welding requires a good deal of equipment, so that it should usually be done in the shops. On the other hand, it is known that the thermit process can easily be carried out on the site. In Poland we only use the latter process : we weld rail joints on the line, between two trains. The welded joints are very subject to cracks. As we have learnt from the reports, the results obtained by certain railways have not been satisfactory; in Rumania for example, there have been many broken rails. The question of welding is an economic one in which a certain part is played by the carrying out of the work.

Dr. Müller (in German). — The advantage of the thermit welding process is that it can be done on the site, whereas electric welding requires ample equipment and so should be done in the shops. In Germany we work as follows : on bridges, i.e. with small lengths of track, the thermit process is used, whereas rails to be welded into long lengths are sent to the shops. The drawback is that these rails have to be transported, but the advantage is that the work can be done at leisure and more carefully. The rails are taken up and carried to the shop. The cost of the two methods is practically the same : the thermit process is dearer than electric welding, but if the transport costs are taken into account, the final results are about the same. If only the joints are to be welded, the thermit process is used; if the rails have to be divided up into sections and the ends have to be drilled, the work is done in the shops.

Mr. Flament, *French Nord Railway* (in French). — Dr. MÜLLER, during the discussions on Summary 1, told us some of the results and conclusions reached on the Reichsbahn about using long rails.

I would like to ask him a question : Is the 60-m. (196' 10 1/4") rail still used in the running road of his railway on the high-speed lines, apart from in tunnels?

Dr. MÜLLER said that in the tunnels the 60-m. rail was the one always used for laying and replacing reasons. Is this rail still used on the lines run over at high speed, and if so what are the regulations on which the use of 30-m. (98' 5 1/8") or shorter rails is based?

Dr. Müller (in German). — At the present time in Germany our standard rail is the 30-m. rail, even for the highest speeds. However, as a trial, we have laid many sections of line with 60-m. rails : in the tunnels this is the standard rail [as, as I said before, we have given up using 2 000-m. (1.24 mile) rails]. Is the 30 or the 60-m. rail to be preferred? I can tell you this : We have about 10 000 km. (6 200 miles) laid with 30-m. rails and about 1 000 km. (620 miles) with 60-m. rails. We have been rather careful about using the latter, because we want absolute certainty in our operating. Some sections of the running road are laid with 60-m. rails, but they are still considered as trial sections. Shall

we decide in the future to use the 60-m. rail exclusively? Very likely, but this is not yet certain, as it may be that with great temperature variations it may be necessary to take the deformation of the track into account. We are bold, but we do not act in the dark. The foot of the long rails is covered with ballast. The temperature is definitely higher in the head than in the foot; tests have shown that there is a difference of about 6 to 8° C. (10.8 to 14.4° F.). I should like to state that in my opinion the 60-m. rail is the better, but certain precautions have to be taken in using it, whereas we are absolutely certain about the 30-m. rail. We have found in Germany, over many years, that the maximum temperature variation is about 80° C. (144° F.). We take 60° C. (140° F.) as the highest summer temperature and —20° C. (—4° F.) as the lowest winter temperature. The gap must not be excessive in winter, otherwise the long rail loses its advantages; the gap must not exceed 19 mm. (3/4 in.). In Egypt, for example, and in France, where there are no very severe winters, the conditions favour the use of long rails.

Mr. Ellson. — On the Southern Railway of England, we have gone very much ahead with welding for the re-conditioning of crossings, and we are finding that we are thereby getting some very substantial economies. I think it might be appropriate to give a few further particulars in regard to the welding of crossings. I have here some notes, but I think it would be better to hand these in, and just touch now on the principal points.

In the last seven or eight years on the Southern Railway, we have had very great increases in traffic intensity, owing to the electrification of the line. Generally speaking, in the whole of the suburban area the traffic has been increased by 150 %, and there is a good number of the axles on each train which have fairly heavy unsprung loads, which are particularly severe on crossings. They give a bump after going over the gap of the crossings, and we had excessive wear on the crossing noses and wing rails in the early part of the electrified working, so much so that it became a problem as to how we were going to maintain our crossings in proper condition, and I was bound to find some means of getting over this difficulty. We are now re-conditioning the whole of the crossings on the entire system by welding. Up to the time when I left London, we had done about 18 500 crossings. We do about 3 000 or 4 000 per year.

The figures of the savings which we make are given in the Appendix which I sent, to the Report I made. Roughly the cost of re-conditioning a crossing is about £ 3 to £ 3 10 sh. 0 d., whereas the cost of a new crossing is about £ 22, making a very substantial saving. But that does not take into account a very important thing, namely, that we do this crossing welding without interfering with the traffic. I have recently computed what the cost of traffic interference is, when work is done on the track and, roughly, I find that it varies from about 33 % to 50 % of the cost of the work, so that besides the actual savings in the cost of re-conditioning the crossings we can, and do get a further great advantage by reason of the monetary saving in non-interference with traffic, and also the Traffic Department get great advantages through not having their trains interfered with.

We have tried both oxy-acetylene welding, which I will call gas welding, and the electric arc welding process, which I

will call arc welding. With regard to gas welding, we find we cannot do that where there is great intensity of traffic. Probably on steam-worked lines where trains pass every 10 minutes or so, gas welding might be the best. It is about 25 % cheaper, but more time is required, because you are dealing with bigger masses of metal at once, and there must be an interval between the completion of a run of welding and the passage of the next train. The interval is necessary to enable the deposit to cool off, otherwise the passage of a train has a tendency to tear away the deposit from the parent metal. In the busy yards round Waterloo, Victoria, London Bridge and Holborn, trains pass every 2 or 3 minutes, and the whole of those crossings are welded by the arc method in between trains. I have found it quite unnecessary to do any welding at night time. We do the whole of the maintenance of the crossings in ordinary day time, in the men's ordinary time, and without interfering with traffic, and that, to my mind, is very important.

There is a further point I would like to touch upon, namely, the method of carrying out this important work of reconditioning crossings, and that is, that the track must be properly packed before the process begins. Otherwise, I am afraid it would be inviting failure. It is most important that you pack the whole of the timber of your track soundly, and that you tighten up all bolts that there may be in the various component parts before commencing the welding. Another important point is that when you have finished your welding, the crossing must be ground to the exact contours required at that particular place by the passage of traffic. You will find that crossings are not worn in exactly the same way at different places. The passage of trains at any place requires careful study, and you must grind your crossings to finish the countours up to the requirements of the traffic at that particular place. Otherwise you might get undue impact on points that would lead to cracks.

There is a further consideration, and I attach importance to this, and that is we do no welding during frosty weather or during very cold winds. We pre-heat the crossings, but we do not post-heat them, and the whole of the welders have strict instructions not to carry out such work except under suitable weather conditions. When the men are not welding, they are doing a very useful duty in going round and examining all the crossings that have been welded so as to see that no defects have developed in the welds. It is important to have a regular and systematic examination of all the welded crossings.

Finally I will refer to the importance of training the men who carry out the work. To start with men who are not properly trained would be really inviting trouble, and it is most important to see that the men are skilled in the welding process. We have a school for that purpose. They make experimental welds there, and until they become expert, in carrying out welds which show no defects whatsoever, they are not allowed to go on to the track.

Mr. Ridet (in French). — I would like to ask Mr. Ellson two questions : (1) How is the preheating carried out? (2) Has it not been found more economcal sometimes to remove points and crossings that have to be built up, especially where there are many trains?

Some railways have used this method, especially on shunting lines : the crossing is removed, built up, and relaid.

Mr. Ellson. — The pre-heating is done by means of a small electrical appliance, and there are a certain number of elements in this small appliance. It fits round the rail, and current is passed through, and the heating is done very simply and inexpensively that way. It is a very light and portable machine, and the men can carry it about. We also do this pre-heating of the part to be welded on non-electrified lines.

With regard to the removal of the crossings from the track during the process of welding we should certainly find that that would add to the expense, whether in shunting yards or in the main roads, because to remove them would mean undoing all the fastenings, disconnecting the signalling apparatus — which is very complicated, because of the amount of colour light signalling in use. In shunting yards, a man will do a crossing in a day, so that there would be no advantage in taking the crossing out.

I shall be very happy to show Mr. Ridet the process whenever he comes to England.

The President (in French). — Gentlemen, I suggest that a vote be taken now on Summary 2, which has been read out. Are you all agreed on the proposed wording?

— *Summary 2 was unanimously adopted.*

We now come to *Summary 3 :*

3. Building up by welding is a means of reconditioning the worn running surfaces and consequently of again lengthening the life of rails and crossing noses.

I am not sure if the English text corresponds exactly with the French text.

Mr. Wallace, *London Midland and Scottish Railway.* — I think that the English text is rather restrictive in meaning, and that the word « noses » should be replaced by « components ».

Mr. Driessen, *Netherlands Railways* (in French). — I think that the text might be read as meaning that the whole of the rail is built up. It says « worn running surfaces » which seems to imply the whole length of the rail. I do not think this is the case.

Mr. Dubus (in French). — We might say : « the worn parts ».

The President (in French to Mr. Driessen). — Do you want any alteration thereto?

Mr. Driessen (in French). — I am not referring to the rails but to details of the points and crossings.

The President. — Not only are crossing components built up, but also the worn parts of rails. Is that agreed?

Dr. Müller (in German). — I agree.

Mr. Dubus (in French). — I propose to say : « running surfaces worn locally ».

The President (in French). — Are we all agreed to say : « ... running surfaces worn locally... ».

— *Unanimously adopted in the following form :*

« 3. Building up by welding is a means of reconditioning running surfaces worn locally, and consequently of again lengthening the life of rails and crossing components. »

We now go on to Summary 4.

4. This results in still further savings on the capital cost and maintenance costs of the track as a whole.

As regards the various welding processes, which are still in the experimental stage, an endeavour is made, by means of observations, studies and experiments, to find out, for each kind of weld, which process is the best from the double point of view of quality and economy. The results obtained in a short time are so promising that it is proposed everywhere to still further extend the use of welding in track work. There is every hope that future progress in this still new field will prove beneficial for the Railways and their respective countries.

Mr. Ellson. — I wish to make a suggestion about the first sentence. Instead of saying : « This results in still further savings on the capital cost and maintenance costs of the track as a whole », I think it would be better — to make the text of the summary more in accordance with the present position — to word this sentence as follows :

« The use of welding results in substantial savings on the maintenance costs of the track as a whole and avoids interference with traffic working. »

Mr. Ridet (in French). — Mr. ELLSON in fact wants to draw attention to the fact that it is not a question of capital but of maintenance costs.

The President (in French). — The following wording is consequently suggested : « The use of welding results in substantial savings on the maintenance costs of the track as a whole », the words « the capital cost and » being deleted.

Dr. Müller (in German). — I agree with this.

— *This alteration was approved.*

The President (in French). — M. Ellson furthermore suggests the following addition : « and avoids interference with traffic working » after the words « of the track ».

— *Adopted.*

The first paragraph of Summary 4 thus becomes : « The use of welding results in substantial savings on the maintenance costs of the track as a whole and avoids interference with traffic working ».

The second paragraph remains unaltered.

— *Adopted.*

The President (in French). — Gentlemen, we have now concluded the examination of the summaries of Question II. At to morrow's meeting we will discuss Question III.

— The Meeting ended at 11.30 a.m.

DISCUSSION AT THE PLENARY MEETING.

June 11th, 1937.

Mr. LE BESNERAIS, Vice President, in the Chair.

General Secretaries : Messrs. P. GHILAIN, de BOYSSON and CAMBOURNAC.

Assistant General Secretaries : Sir H. Nigel GRESLEY and Dr. Th. KITTEL.

The President (in French). — Gentlemen the first point on the agenda is the final ratification of the Summaries adopted by the various Sections since our meeting on June 7th. I do not propose to have them all read out to you, as everyone has had the opportunity of making himself familiar with them in the *Daily Journal of the Session. (Admitted.)*

Mr. Ghilain, the *General Secretary,* will be good enough to enumerate in turn the different points in these summaries, question by question, giving the Delegates the opportunity after each to raise any points necessary.

Mr. Ghilain, *General Secretary.* — We will begin by considering the Summaries for Question II which were published in No. 6 of the *Daily Journal of the Session.*

— *No points were raised.*

The President. — We consequently take the Summaries of Question II as approved.

Summaries.

« 1. The application of welding processes to track equipment in order to increase the length of rails hardly dates back more than six years. In spite of its recent introduction, welding has not only given rise to progress in track construction, but also to appreciable savings in the expenditure necessary for laying and maintaining the track.

« The chief advantage conferred by welding is that rail joints can be appreciably reduced in number, or even entirely eliminated on long track lengths. Moreover, welding enables composite rails to be constituted by welding together two rails of different profiles, which is an excellent means of abolishing special fish-plates, which fish-plates often are a cause of dislocation.

« It is desirable that studies and experiments should continue to be carried out with regard to the behaviour of long welded rails on running lines, under the heavy rolling loads, as well as to the width of the joint gap with different lengths of rail and different temperatures.

« Moreover, the use of extra-long rails not only ensures smooth and comfortable riding of the vehicles, but such vehicles are also subject to lesser fatigue.

« On bridges, the welding of the joints appreciably diminishes the dynamic effects, which contributes to the pre-

« servation of the whole of the different « parts of the structure.

« Savings may therefore be looked for « in the expenditure necessary for main- « taining and building vehicles and brid- « ges, economies which will be all the « more appreciable on those sections of « line where the longest lengths of « track are laid with long rails.

« Similarly, the use of welded rails « should be considered for heavily loaded « lines in marshalling yards when the « ballast and side-ballast are compact « and well knitted together, as the risks « of transverse deformation are thus « very much reduced.

« It is desirable that the welding of « rails should be checked during execu- « tion, by means of suitable tests (me- « chanical and metallographic).

« 2. By the use of welding for joining « rails and other track components, par- « ticularly when fabricating points and « crossings, it is possible to reduce the « number of fastenings subject to heavy « wear. The resistance to wear and the « life of points and crossings will be « increased thereby.

« 3. Building up by welding is a means « of reconditioning running surfaces « worn locally, and consequently of again « lengthening the life of rails and cross- « ing components.

« 4. The use of welding results in sub- « stantial savings on the maintenance « costs of the track as a whole and avoids « interference with traffic working.

« As regards the various welding pro- « cesses, which are still in the expe- « rimental stage, an endeavour is made, « by means of observations, studies and « experiments, to find out, for each « kind of weld, which process is the « best from the double point of view of « quality and economy. The results ob- « tained in a short time are so promising « that it is proposed everywhere to still « further extend the use of welding in « track work. There is every hope that « future progress in this still new field « will prove beneficial for the railways « and their respective countries. »

[625. 17]

QUESTION III.

Methodical and periodical maintenance of :

1. metal bridges; 2. signals; 3. metal supports carrying the contact wire on electric railways.

Organisation. — Working methods. — Materials used.

Preliminary documents.

Report (Great Britain Dominions and Colonies, America, China and Japan), by Wm. A. Fraser. (See *Bulletin*, September 1936, p. 875, or special issue No. 1.)

Report (Netherlands and Colonies, Germany, Belgium and Colony, Luxemburg, Denmark, Norway, Sweden, Finland, Poland, Austria, Hungary, Switzerland), by Th. W. Mundt. (See *Bulletin*, March 1937, p. 775, or special issue No. 24.)

Report (Bulgaria, Egypt, Spain, France and Colonies, Greece, Italy, Portugal and Colonies, Rumania, Czechoslovakia, Turkey and Jugoslavia), by V. Degreef. (See *Bulletin*, May 1937, p. 1245, or special issue No. 34.)

Special Reporter : Th. W. Mundt. (See *Bulletin*, June 1937, p. 1505.)

DISCUSSION BY THE SECTION.

Meeting held on June 9th, 1937.

Sir Ralph Lewis WEDGWOOD in the Chair.

The Meeting opened at 9.30 a.m.

The President (in French). — Gentlemen, to-day we will discuss Question III.

I call on the *Principal Secretary*, Mr. Dubus, who will give some information in connection with the wording of the summaries.

Mr. Dubus, *Principal Secretary* (in French). — Gentlemen, before beginning the discussion, I would like to call your attention to the fact that the Reporters, Messrs. Mundt, Fraser and De Greef, who had not met previously, held a meeting during which they drew up some summaries slightly different from those given in the Special Report. It is these summaries that the Section will be asked to vote upon.

Mr. Mundt, *Special Reporter*. — Mr. President, may I first of all thank my two Co-Reporters, Messrs. FRASER and DE GREEF, whose valuable collaboration in investigating the question with which we are dealing greatly assisted me in drawing up my special report. I would like to thank Mr. De Greef in particular, who had to take the place of the third reporter, Mr. Mendoza, at the last moment and so had to draw up his report at very short notice. I congratulate him on the way he has carried out this difficult work.

We will now go on to consider the summaries. Here is the text of *Summary 1* :

1. It is advisable that the staff responsible for the design and construction of metal bridges should directly or indirectly intervene in the maintenance of such structures.

The President. — Are there any observations?

— *As no one wished to say anything, Summary 1 was adopted.*

Mr. Mundt. — *Summary 2* :

2. Depending on the size of the bridge, the use of pneumatic or electric de-rusting apparatus will reduce maintenance costs.

Mr. Driessen, *Netherlands Railways* (in French). — I think that the use of such equipment requires much care in view of the fact that there are cases in which their use is not economical.

Consequently I suggest we say : « ... will, *in certain cases...* » in order to make it clear that the different cases which arise must be considered.

Mr. Mundt. — Agreed.

The President (in French). — No objection being raised, *Summary 2* is adopted with this slight alteration.

Mr. Mundt. — *Summary 3* :

3. When periodical re-painting is undertaken, it is sometimes unnecessary to treat large surfaces which are still in a good state of preservation, in the same manner as necessary for other surfaces, unless æsthetic considerations require it; in such a case it should be sufficient to apply only the final coat.

The President. — Does the Meeting agree concerning this wording?

— *Adopted without modification.*

Mr. Mundt. — *Summary 4* :

4. With a view to avoiding the contingency of removing scaffolding, it is advisable to apply a binding material which makes it possible to apply the following coat of paint soon after the previous coat is put on.

The President. — Are we at one in adopting Summary 4?

— *Summary 4 was adopted.*

Mr. Mundt. — *Summary 5* :

5. The use of spray-painting can, in many cases, enable a saving in the repainting of bridges to be effected.

Instead of « ... the repainting of bridges... » I think it would be preferable to say « ... the painting... ».

Mr. Ridet, *French East Railways* (in French). — I would like to alter « in many cases » to « in certain cases ».

The President. — No objections?

— *Adopted with the modifications proposed.*

Mr. Mundt. — *Summary 6 :*

6. De-rusting work and the application of red lead and other paint should be carried out by the Railway's own staff, in preference to contracting out this work.

Mr. Desaleux, *Paris-Lyon-Méditerranée Railways* (in French). — I find that the wording of this summary is rather too peremptory. There are certain cases in which it is better to have the work done by contract.

Mr. Lemaire, *Belgian National Railways Company* (in French). — I agree with Mr. DESALEUX, in the sense that on the Belgian Railways we have found that the most important part of the work is the de-rusting. It is very difficult to get contractors to de-rust thoroughly the inaccessible parts, the crossing parts, corners and angles, for example The most valuable part of the work is, however, the de-rusting, cleaning and sand-papering. I suggest we say : « The de-rusting work and application of red lead and other paint by the railways' own staff is to be preferred, especially in the case of de-rusting. »

In certain cases we have been able to have the red lead and other painting done by contract. This can be done under better conditions, but in the case of de-rusting, I think it is specially important not to have this done by contract.

In my opinion, therefore, this paragraph should be altered, and we should say : « is to be preferred »; on the other hand we should make a distinction between de-rusting and painting.

Mr. Dubus (in French). — I suggest we say : « It is especially valuable to have the de-rusting done by the railways' own staff ».

Mr. Ridet (in French). — I quite agree with Mr. LEMAIRE on the sense of the alteration that should be made in the wording, and about the importance of this difficult work to the railway.

However, to give in a general formula the various methods of doing the work in the different countries, which can vary according to the kind of work and the skill of the workmen, I would like to know if Mr. LEMAIRE would agree to the following compromise : « De-rusting work and the application of red lead and other paint may be carried out either by the Railway or by contract but, in the latter case, should be closely supervised by the Administration. »

I think it is possible to have de-rusting work done by contract, but there is not much interest in doing so, as it is impossible for the contractors to estimate exactly the cost of the work to be done if the de-rusting is to be properly carried out; I think it is better to have it done by the railway itself. The work, moreover, is carried out more thoroughly when it is done by the railway staff.

Mr. Mundt (in French). — I agree with Mr. RIDET, except about the de-rusting.

Mr. Ridet (in French). — I think that the contractor cannot calculate the cost price in advance, but perhaps it is possible to calculate this not by a unit of measure, but by the hour.

Otherwise, I entirely agree with Mr. MUNDT.

Mr. Fraser, *Reporter.* — I should like to add a word to what Mr. Mundt has just said. I think it would be unfortunate if the de-rusting and painting of the steelwork were separated, the one to be done

by the railway company's staff, and the other by contractors.

The essence of good painting is that the paint should be applied immediately the de-rusting is completed. I can visualise that when the Company's staff carry out the de-rusting process, it must be some days before the contractor's staff would be ready to do the painting work, and then of course much of the good work done by the Company's staff would be lost.

I think that the Summary as proposed by Mr. Mundt should be allowed to stand.

Mr. Dubus (in French). — The present text, as defined by Mr. Fraser, is sufficiently wide in scope to be acceptable to everyone.

Mr. Ridet (in French). — Does Mr. Fraser agree with me?

The President. — I don't think so. Mr. Fraser wishes to retain Mr. Mundt's wording.

Mr. Bouché-Leclercq, *French Est Railways* (in French). — I suggest we leave out the words relating to painting in the Special Reporter's text. The following is then left :

« De-rusting work and the application of red lead by the railways' own staff should be preferred to contracting out this work. »

Mr. Desaleux (in French). — I would like to point out that on the P.L.M. all the work, including the de-rusting, is done by contract in most cases, and we have found this method most satisfactory.

I recognise that in some cases it may be better to have the work done by the railway itself, but we prefer to have it done by contract; I do not think the summaries should be so affirmative.

Mr. Driessen (in French). — I think a distinction should be made not only between de-rusting and painting, but also from the point of view of the cost of the work.

Undoubtedly the cost of carrying out the work by the railways' own staff is higher than when it is done by contract.

Account must be taken not only of the labour costs properly speaking, but also of the period between two repaintings. I am sure that if the work is done by the railway staff, this period will be much longer, and consequently it is more economical to spend more in having the work done by the railway staff rather than by contractors whose men do not always work as well as our own men.

For this reason I would like to make an addition to Mr. MUNDT's text. We might say, for example :

« De-rusting work and the application of red lead and other paint by the Railway itself are to be preferred to contracting out, especially as regards the quality of the work. »

Possibly it will cost somewhat more, especially for the first costs, but in the end it is more economical.

Mr. Lang, *Alsace-Lorraine Railways* (in French). — I would like to say a word about the question of the quality of the work, which has just be raised.

I think that the first condition for getting good quality work is to have good workmen, well-trained gangs, men who can easily get about on even large structures. Though on some railways there may be sufficient metal bridges and large structures for gangs of this description

to be formed, this does not apply to every railway, and in this case — which applies, for example, to the Alsace-Lorraine Railways — it is much better to have recourse to contractors whose men are then much more skilled.

Under these conditions I suggest the following wording : « De-rusting work and the application of red lead, carried out either by the railway's own staff if circumstances make this possible, or by contract, the work then being paid for by the hour in order to allow of careful supervision... »

Mr. Mundt (in French). — I would like to raise once more this point : why go to a contractor when we can do the work ourselves? In this way we eliminate the profit the contractor gets from doing the work.

Mr. Lemaire (in French). — This is a complicated question which I do not think it is easy to answer.

From a purely technical point of view, I quite agree with Mr. DRIESSEN. In Belgium, bridges are systematically and periodically maintained, and we have in fact found that the period between repaintings is longer when we ourselves have done the work.

Consequently, the quality of the work must have been better. I am speaking from the technical point of view; from the economic point of view it costs more, but as the work can be done at longer intervals I think that, taking it all in all, I prefer having the work done by the railway itself.

I would like to ask our P.L.M. colleague whether this railway has found it possible to compare the work done by the railway with that done by contract, and if, after investigation, a decision has been taken in favour of contract work or otherwise.

The case of large bridges is different; here the workmen must be more or less acrobats, and we have generally no such men, but this is an exceptional case.

For ordinary bridges, under normal conditions, I prefer having the work done by the railway itself.

I suggest therefore that we simply say — since we must find a text that we can all agree to :

« De-rusting work and the application of red lead by the railways' own staff is to be decided taking into account the quality of the work. »

It all depends in fact on the policy followed by the Railways; some Railways do not carry out such work by themselves, and consequently we cannot say we recommend it in every case.

Mr. Dubus (in French). — The wording would consequently be :

« De-rusting work and the application of red lead by the railway's own staff is to be recommended taking into account the quality of the work. »

The President. — Are we agreed?

Mr. Desaleux (in French). — I will reply to Mr. LEMAIRE by stating that we have not made any comparative investigation between work done by the railway or by contract. Perhaps this is why we do not approve of a definite statement that this work should be done by the railways' own staff. Even the wording suggested last : « ... is to be recommended, taking into account... » is not quite to my liking, and I suggest we say : « ... may offer advantages from the point of view of the quality of the work. »

The complete text would be :

« De-rusting work and the application of red lead and other paint, carried out

by the Railway's own staff, may offer advantages from the point of view of the quality of the work, as compared with the work executed by contractors. »

Mr. Lemaire (in French). — I agree about this new wording, since the comparisons are not based on the same factors. There are some Railways who always do the work themselves, whereas others always have it done by contract, and still others use both methods.

I think that Mr. DESALEUX's text meets the general requirements and may be adopted.

The President. — Are there any objections?

— *As no one else wished to say anything, Summary 6 was adopted in this modified form.*

Mr. Mundt. — *Summary 7 :*

7. Complete removal of mill scale, followed immediately by the application of a priming coat, reduces the danger of corrosion beneath the paint in the case of new structures, and is conducive to savings in maintenance painting work.

Mr. Balling, *Paris-Orléans Railways* (in French). — I am wondering if it would not be better to delete this summary. After all, the Railways do not agree about the efficacy of this method. I do not think it a good plan to state in one of the Congress' official Summaries that this method is to be recommended simply because this is the opinion of certain Railways. Furthermore the people who read the Congress Summaries will also read the discussions and so see that this question is under dispute.

Mr. Dubus (in French). — Does the Section agree that this Summary should be deleted?

— *Summary 7 was deleted.*

Mr. Mundt. — *Summary 8 :*

8. In view of the increased train speeds it is advisable, in order to ensure better preservation of old bridges, to use rails assembled by welding in order to avoid joints.

Mr. Driessen (in French). — I want to know why special mention is made of « old bridges ».

Doesn't this apply to all bridges?

Mr. Mundt (in French). — We are only dealing with the maintenance of bridges.

Mr. Driessen (in French). — We might say « all bridges » and delete the word « old ».

Mr. Lemaire (in French). — In principle I am fully in agreement with this point, but I want to ask for some further information on this question. No doubt one of the French Delegates will be able to help me.

I hear that certain French Railways have replaced lead bearings of the type usually put under bridges by rubber bearings which should give good results.

We have applied this method on the Belgian Railways to rails, by fitting rubber plates under them.

Mr. R. Lévi, *French State Railways* (in French). — Mr. LEMAIRE's question certainly applies to the French State Railways, where rubber plates have been successfully used for some years to lessen the maintenance costs of metal bridges and their brickwork.

Rubber bearings have been in use for

five years on the State system; they were first used to avoid having to rebuild a bridge which was showing traces of fatigue and it was absolutely impossible to interrupt the service in order to repair it.

The good results obtained led us to use this method generally and replace the lead bearing plates, which generally got crushed and disappeared, by rubber plates 25 to 40 mm. (1 in. to 1 9/16 in.) thick. The rubber used has been specially designed for strength, so that it will retain a certain elasticity, while having quite a long life.

The good results obtained led us in addition — this may be of interest in connection with the question we are considering — for the good preservation of the metal parts of the bridge to fit rubber plates under the longitudinal stringers, which plates, generally speaking, take up the violent shocks on the structure.

We actually found after the application of the device that there is a reduction in vibrations, and much less noise, and in the case of certain bridges wherein the main girder assemblies showed a tendency to get loose, a perfectly good condition of the joints.

For the information of those interested, I may say that an article published in the *Annales des Ponts et Chaussées* in September 1936 gave detailed information about this method.

Mr. Lemaire (in French). — I am very grateful to Mr. Lévi for the information he has just given us.

Mr. Dubus (in French). — I would like to know if this method also covers the stringers?

Mr. R. Lévi (in French). — We have sometimes plates under the stringers.

The President (in French). — I take it that there is general agreement as to Summary 8.

Mr. Mundt (in French). — Leaving out the word « old ».

— *Summary 8 was adopted, leaving out the world « old », and became the new Summary 7.*

Mr. Mundt. — *Summary 9 :*

9. At the ends of movable bridges, it is advisable to provide rail joints not giving rise to shocks.

Mr. Driessen (in French). — In my opinion we should not mention « rail joints » here; it would be better to say « arrangements not giving rise to shocks from the passage of trains ».

Mr. Mundt (in French). — Yes, I think that would be better.

The President (in French). — As no objections are being raised, Summary 9 is adopted *with the slight alteration suggested by* Mr. DRIESSEN.

Mr. Mundt. — *Summary 10 :*

10. Savings can be effected in many instances by the use of electric welding for repairing and strengthening bridges.

Mr. Lemaire (in French). — I agree that the use of welding makes it possible to obtain economies, but not only money savings must be envisaged, there is also the question of the operating.

I suggest we say : « Savings can be effected in many instances and interfe-

rence with the running of the traffic avoided by the use of electric welding... »

The President (in French). — Does the Section agree to this alteration?

— *Adopted in this modified form (new Summary 9).*

Mr. Mundt (in French). — Summary 11 of our special report has been replaced by the following :

11. The lower flanges of girders subjected to engine chimney blast can be efficaciously protected by means of reinforced concrete.

Mr. Ridet (in French). — I think this paragraph should be completed by giving the precautions that should be taken in carrying out this reinforced concrete work.

In my opinion a minimum thickness of 3 cm. (1 3/16 in.) is absolutely indispensable for encasing the metal, as otherwise the exact position of the metal relatively to the forms is unknown, so that it may be too near the surface and badly encased. If any part is badly covered, the steel will be attacked by the smoke, and the resulting rust will break up the concrete.

Therefore, I think this summary should be completed by pointing out the precautions to be taken in making the concrete casing, and the minimum thickness given as 3 cm., if the Meeting agrees.

Mr. Lang (in French). — I would like to know, as regards this Summary, if the protection of the lower flanges of bridges is yet out of the trial stage, and if it can be definitely stated that this precaution is effective, and the concrete never breaks away.

Is the experience long enough to justify adopting such a summary?

Mr. Wallace, *London Midland and Scottish Railway.* — I would like to say that our experience on the London Midland and Scottish Railway has been a very mixed one. We tried a lot of this protection by means of concrete cast in situ a number of years ago, and a large proportion of it has parted company with the bridges, and now, where we adopt this form of protection, we are using a pre-cast concrete member bolted to the bottom flange of the girder and grouted into position. We found that the concrete cast in situ is not standing up and resisting the blast of the locomotives, and we think that our experience has been such that we would phrase this conclusion in more general terms, and say something to the effect that in some cases it has given protection, because at any rate on the London Midland and Scottish Railway it has not given the protection desired.

Mr. Lang (in French). — Mr. WALLACE's reply makes it clear that we are still in the experimental stage, specially as the method of protection he mentioned cannot be considered as a casing.

I gather from the summary that it is a question of casings. As far as I know this means putting concrete all round the steel, not precast concrete slabs. This is a way of protecting, but it is not encasing.

If the summary is to remain as it stands, we are affirming just the opposite to what Mr. WALLACE has just said.

I think it would be better to give up this summary altogether.

Mr. Lemaire (in French). — I do not think we should give up this text, as this would be a negation of all progress.

I think our experience is perfectly in agreement with such an opinion; for at

least twenty years bridges have been encased and protected, either encasing them in concrete during construction, or afterwards by some sort of concrete slabs suspended and fastened to the lower part of the metal bridge.

I think we would not be going too far if we said that in certain cases protection by means of layers of reinforced concrete or separate concrete parts has given good results. Naturally, the work must be done carefully. It is not the method that is good or bad, but the way of carrying it out, and if this protection by means of a casing or concrete slabs is carefully done, using suitable fastening means, and at least 2 to 3 cm. (25/32 to 1 3/16 in.) of concrete, the results are undeniable. Our experience on the Belgian Railways dates back before the war, and I am certain that in many cases this solution has proved its worth.

Consequently I think it would be a mistake to delete this summary; we should keep it, if only as a reminder for the next Congress.

The President (in French). — The wording would consequently be as follows : « The lower flanges of girders submitted to engine chimney blast can, in certain cases, be efficaciously protected by means of reinforced concrete ».

Mr. Driessen (in French). — Why « the lower flanges » and not just « the flanges »?

Mr. Dubus (in French). — It means the flanges in direct contact, but we might just as well say « the flanges ».

Mr. Lang (in French). — We are affirming, therefore, that the protection is effective in certain cases? Just now Mr. Wallace protested against the use of the word « efficaciously ». I agree with him, and this word were better left out.

Mr. Dubus — Agreed.

The President (in French). — The Summary would consequently be worded as follows : « The flanges of girders subjected to engine chimney blast can, in certain cases, be protected by means of reinforced concrete ».

— *Adopted as new Summary 10.*

Mr. Mundt. — *Summary 12 :*

12. It appears advisable to appoint a special Division or Section for maintaining signal apparatus and all telegraphic and telephonic means of communication.

Mr. Bound, *London Midland and Scottish Railway.* — May I suggest, if it is agreable to our Continental friends, to substitute the words « together with » instead of « and », as I think that this would be more in accord with the organisation to-day.

The President (in French). — The wording would consequently be as follows : « It appears advisable to appoint a special division or section for maintaining signal apparatus, together with all telegraphic and telephonic means of communication. »

Are there any remarks?

— *Summary 12 was adopted in its modified form, and became the new Summary 11.*

Mr. Mundt. — *Summary 13 :*

13. It is desirable to use the most skilled employees in the signalling services, the question of seniority being considered as of secondary importance.

Mr. Driessen (in French). — Mr. President, I think this summary is obvious, not only as regards the maintenance staff, but all the staff generally, and I think it might be deleted, seeing that this question is somewhat outside the sphere of this Section.

The President (in French). — Does the Section agree as to the deletion of this Summary?

— *Summary 13 was deleted.*

Mr. Mundt. — *Summary 14 :*

14. Periodical checking of the luminosity of signals does not appear to be necessary, as a rule; the reports of the locomotive running department staff are sufficient for pointing out any defects of signals.

Mr. Bound. — I would like to suggest this statement hardly does credit to an Administration whose aim is efficiency.

As I read it, the periodical checking of the luminosity of signal lamps (oil) is not thought to be necessary. That is very indefinite but on the London Midland and Scottish Railway we do lay stress on the necessity of periodical checks of the luminosity of signals.

In this connection I might mention there are two Sections of the Railway concerned, there is the Operating Department who trim and light the lamps and there is the Signal and Telegraph Department who provide and maintain the lamps themselves, the latter Department being responsible for correct focussing.

We expect our Inspectors when travelling about the line at night to check the focussing of the lamps whilst the trimming and burning is checked by Traffic Lamp Inspectors who are specially appointed for this duty.

It appears to me we should not wait until faults occur, but that we should try to put them right beforehand; in other words we should anticipate the conditions and so prevent having reports from the Locomotive Running Department.

The President (in French). — We might perhaps say : « Periodical checking of the luminosity of signals does not, as a rule, appear to be necessary to all Administrations... »

Mr. Fraser. — I am of the opinion that the reports of the train staff should be sufficient, but this view does not agree with that of the L.M.S. Delegate, who wishes periodical checks to be carried out.

The President (in French). — It appears that the representatives of two British Railways, are of a different opinion, and that the wording should be altered.

Mr. Dubus — It is therefore a question of finding a solution which satisfies everybody.

The President (in French). — I suggest the following text : « Periodical checking of the luminosity of signals is not thought to be necessary by all Administrations; the reports of the locomotive running department staff are considered from their point of view sufficient for pointing out defects of signals. »

Does everybody agree?

— *Summary 14 (new 12) was adopted in this modified form.*

Mr. Mundt. — *Summary 15 :*

15. It is desirable that maintenance staff responsible for checking the detector slide clearance use a special gauge.

— *Summary 15 was adopted (new Nº 13).*

Mr. Mundt. — *Summary 16 :*

16. It is as a rule advisable to slightly under-run signal lamps.

Mr. Driessen (in French). — This is obvious.

Mr. Dubus (in French). — I agree; this summary is obvious to every electrician.

Mr. Ridet (in French). — I should like to know, in connection with this summary, if any Delegates have made experiments to find out under what conditions the phantom effects are reduced to the minimum. There is no mention of phantom effects in the summaries, but they are mentioned in the reports, and I would like to profit by the discussion on the question of lamps to learn if any railway has made trials like those we have undertaken on the Est System.

The result of our experiments is that phantom effects are appreciably reduced if pear-shaped lamps are used instead of spherical bulbs which give a greater reflection.

Mr. Fraser. — All the Administrations covered by my report favour the adoption of vizors.

Mr. Ridet (in French). — In my opinion this is not enough.

Mr. Dubus (in French). — This point is actually outside our subject.

The President (in French). — Are there any objections as regards Summary 16?

— *Summary 16 was adopted (new Nº 14).*

Mr. Mundt. — *Summary 17 :*

17. Rigid point rodding consisting of tubes or rolled sections has, as compared to double galvanised wires, the drawback of requiring repainting at regular intervals.

Mr. Lang (in French). — In its present form this summary shows a marked preference for two-wire transmissions, this preference being based on a secondary point of view, namely the painting. Now, I do not think that there is unanimous agreement on the subject of double-wire transmissions and rigid point rodding.

On our Railway System, we much prefer the rigid point rodding. Though it is accurate to state that such rodding requires re-painting, I do not think this is a drawback, and I want the word « drawback » to be deleted; for example we might say : « Rigid point rodding consisting of tubes or rolled sections must be repainted at regular intervals ».

This wording will, I think, meet with everyone's approval.

Mr. Dubus (in French). — I suggest we delete this summary.

Mr. Mundt. — Agreed.

Mr. Lemaire (in French). — My opinion is contrary to that of Mr. LANG. We prefer double galvanised wires to rigid point rodding, and when carrying out complete overhaul or systematic maintenance of the equipment, we are removing the rigid point rodding.

I also think that the best solution would be to delete this summary which is not very interesting from the point of view of maintenance.

The President (in French). — Does

the Section agree as to the deletion of this summary?

— *Summary 17 was deleted.*

Summary 18 :

18. The use of enamelled iron signal arms is, in the long run, more economical.

The President. — Are there any remarks?

— *Adopted (as new Summary 15).*

Mr. Mundt. — *Summary 19 :*

19. It appears unnecessary to remove track circuit relays for overhaul in the workshops at regular intervals, if well trained staff are available, who can examine them in situ.

Mr. Balling (in French). — I wish to point out that the employee who checks in situ has not to touch the relays, which are generally sealed; he merely has to check (vérifier) the characteristics, but does not open the relay. This can only be done in the shops. I am in favour of a simple examination in the track.

Mr. Dubus (in French). — Can you suggest a text?

Mr. Balling. — We might say : « It appears unnecessary to remove track circuit relays for periodic overhaul, if well trained staff are available who can examine (« examiner ») the characteristics in situ ».

The President (in French). — I do not quite grasp the difference between « examiner » and « vérifier ».

Mr. Balling (in French). — What I want to make quite clear is that the different parts of the relays are not to be touched; the employee merely connects his voltmeter or ammeter, looks at the registration, and that is all.

Mr. Bound. — I propose that the wording of the Summary should be altered to read : « It is desirable to remove track circuit relays for periodical overhaul in the workshops. »

The President (in French). — This opinion is quite the opposite of that which has just been voiced.

Mr. Ridet (in French). — In my opinion, the different opinions must be taken into account, or the whole summary deleted.

Mr. Driessen (in French). — If we added : « ... if the staff are available and there is time to make the examination »?

The President (in French). — I suggest that « ... without any interruption of the traffic » be added to Mr. Balling's wording.

We would thus have : « It appears unnecessary to remove track circuit relays for periodical examination if well-trained staff are available who can examine them in situ without any interruption of the traffic. »

Are there any objections?

— *Summary 19 was adopted in this form, and became the new summary 16.*

The President (in French). — I suggest that the Meeting be closed now, and the remainder of the summaries be discussed to-morrow. *(Adopted.)*

The Meeting ended at 11.35 a.m.

Meeting held on June 10th, 1937.

MR. Y. HASHIGUCHI, VICE-PRESIDENT, IN THE CHAIR.

The meeting began at 9.30 a.m.

The President. — Gentlemen, today we will continue the discussions on Question III, going on to the summaries dealing with the metal supports carrying the contact wire on electric railways.

Mr. MUNDT, the *Special Reporter*, will begin the proceedings.

Mr. Mundt. — *Summary 20 :*

20. With a view to eliminating or reducing re-painting of supports carrying the overhead contact wires, it appears that complete galvanisation of the supports gives the best results.

Mr. Dubus (in French). — Does everyone agree with this summary?

— *Adopted (as the new No. 17).*

Mr. Mundt. — *Summary 21 :*

21. Metal spraying of supports carrying contact wires does not always provide sufficient protection against rusting of steel parts.

Mr. Eggenberger, *Swiss Federal Railways* (in German). — We use metal spraying when the supports are not riveted, as they cannot be completely galvanised. To give a better and more effective coating, an additional coat of oil paint is given to fill up any pores which may have been left after metal spraying. This additional precaution has given satisfactory results, and I suggest the following addition be made to Summary 21:

« In every case it is as well to give a further coat of oil paint to fill up any pores that may be left. »

Mr. Dubus (in French). — I suggest this summary be completed as follows :

« As a precautionary measure, a final coat of linseed oil paint should be applied in order to fill up any pores which may have been left as the result of the metal spraying. »

Is this agreed?

— *Summary 21 was adopted as new Summary 18.*

Mr. Mundt. — *Summary 22 :*

22. The use of supports consisting of rolled sections with wide flanges, to which tie-rods or brackets are fixed, lowers the initial cost as well as maintenance costs.

Mr. Balling (in French). — I should like to add to the end : « ... in the majority of cases. » There are circumstances in which this is really not advantageous, though it may be in many cases.

The President. — This summary would then read as follows :

« The use of supports consisting of rolled sections with wide flanges which have the tie-rods or brackets clamped instead of being bolted or riveted, lowers the initial, as well as the maintenance costs in the majority of cases. »

Is there any objection?

— *Adopted as New Summary 19.*

The President. — Gentlemen, this ends the discussion on Question III, the last point on the Agenda of Section I, and I wish to thank you for the interest you have shown in our discussions and the way in which you have collaborated in making this Session a success. *(Applause.)*

Mr. Lemaire (in French). — I think, Gentlemen, that you will all agree with me in thanking the President of our Section, as well as the talented and courageous Secretaries, who have devoted so much time to ensuring the smooth running of the work of the Section. *(Applause.)*

— The Meeting then was brought to an end.

DISCUSSION AT THE PLENARY MEETING.

(June 11th, 1937).

Mr. LE BESNERAIS, Vice President, in the Chair.

General Secretaries : Messrs. P. GHILAIN, de BOYSSON and CAMBOURNAC.

Assistant General Secretaries : Sir H. Nigel GRESLEY and Dr. Th. KITTEL.

Mr. Ghilain, *General Secretary.* — We now have to examine the summaries relative to Question III, which were published in the *Daily Journal of the Session*, Nos. 7 and 8.

— *These summaries were then read out.*

The President. — Is there any objection to this wording?

— *No objections were raised.*

The summaries of Question III will consequently be considered as ratified.

Summaries.

« 1. It is advisable that the staff responsible for the design and construction of metal bridges should directly or indirectly intervene in the maintenance of such structures.

« 2. Depending on the size of the bridge, the use of pneumatic or electric de-rusting apparatus will, in certain cases, reduce maintenance costs.

« 3. When periodical re-painting is undertaken, it is sometimes unnecessary to treat large surfaces which are still in a good state of preservation, in the same manner as necessary for other surfaces, unless æsthetic considerations require it; in such a case it should be sufficient to apply only the final coat.

« 4. With a view to avoiding the contingency of removing scaffolding, it is advisable to apply a binding material which makes it possible to apply the following coat of paint soon after the previous coat is put on.

« 5. The use of spray-painting can, in certain cases, enable a saving in the painting of bridges to be effected.

« 6. De-rusting work and the application of red lead and other paint, carried out by the Railway's own staff, may offer advantages from the point of view of the quality of the work, as compared with the work executed by contractors.

« 7. In view of the increased train speeds, it is advisable, in order to ensure better preservation of bridges, to use rails assembled by welding in order to avoid joints.

« 8. At the ends of movable bridges, it is advisable to provide arrangements not giving rise to shocks from the passage of trains.

« 9. Savings can be effected in many instances, and interference with the running of the traffic avoided, by the

« use of electric welding for repairing « and strengthening bridges.

« 10. The flanges of girders subjected « to engine chimney blast can, in cer- « tain cases, be protected by means of « reinforced concrete.

« 11. It appears advisable to appoint « a special division or section for main- « taining signal apparatus, together with « all telegraphic and telephonic means « of communication.

« 12. Periodical checking of the lumi- « nosity of signals is not thought to be « necessary by all Administrations; the « reports of the locomotive running de- « partment staff are considered, from « their point of view, sufficient for point- « ing out defects of signals.

« 13. It is desirable that maintenance « staff responsible for checking the de- « tector slide clearance use a special « gauge.

« 14. It is, as a rule, advisable, to « slightly under-run signal lamps.

« 15. The use of enamelled iron signal « arms is, in the long run, more econo- « mical.

« 16. It appears unnecessary to remove « track circuit relays for periodical exa- « mination if well-trained staff are avai- « lable who can examine them in situ « without any interruption of the traffic.

« 17. With a view to eliminating or « reducing re-painting of supports car- « rying the overhead contact wires, it « appears that complete galvanisation of « the supports gives the best results.

« 18. Metal spraying of supports car- « rying contact wires does not always « provide sufficient protection against « rusting of steel parts.

« As a precautionary measure, a final « coat of linseed oil paint should be « applied, in order to fill up any pores « which may have been left as the result « of the metal spraying.

« 19. The use of supports consisting of « rolled sections with wide flanges which « have the tie-rods or brackets clamped « instead of being bolted or riveted, « lowers the initial, as well as the main- « tenance costs in the majority of cases. »

Competition by roads, waterways and airways.

(Continued) (*).

NORWAY.

Information received from the General Management of the Norwegian State Railways.

In order to meet road competition and also with a view to a general easement of the system of railway rates and charges in operation, the Act of 1st October, 1936, authorised the issue of revised tariffs.

As regards goods traffic, the new scales of charges are based on the following principles.

Express goods service.

There is a tariff for small parcels of 5, 10, 15, 20 and 25 kgr. (11, 22, 33, 44 and 55 lb.), the scale of charges being as follows :

Distance. Km. (*Miles*).	Up to 5 kgr.	5.1 to 10 kgr.	10.1 to 15 kgr.	15.1 to 20 kgr.	20.1 to 25 kgr.
	a	*b*	*c*	*d*	*e*
	kr. (*)	kr.	kr.	kr.	kr.
1 to 70 (*1* to *43.5*).	0.40	0.40	0.50	0.60	0.70
71 to 140 (*4.41* to *87*).	0.40	0.50	0.80	1.00	1.20
141 to 210 (*87.6* to *130.5*).	0.50	0.70	1.40	1.40	1.60
211 to 300 (*131.1* to *186 4*).	0.60	0.90	1.40	1.80	1.90
301 to 600 (*187.0* to *372.8*).	0.60	1.00	1.60	2.00	2.40
Over 600 (*372.8*)	0.80	1.20	2.00	2.40	2.80

(*) Kr. = Norwegian crown.

Parcels sent carriage forward are charged 0.20 kr. extra.

Less than wagon load traffic.

Consignments weighing under 5 tons (part loads) are charged under class 1*i* (carriage paid) or class 1*i* (carriage forward) as the case may be.

Full wagon load traffic.

Class 2*i* contains charges for wagon loads « carriage paid » and « carriage forward », with a minimum of 5 tons per wagon.

Perishable goods in less than wagon loads are consigned as « express goods » and charged at the rates for « ordinary goods », fresh herrings and other fish being similarly dealt with.

(*) See *Bulletin of the Railway Congress Association* since June 1934 issue.

Ordinary (slow) goods service.

Part load traffic.

Class 1 (carriage paid) and Class 1 (carriage forward) apply to consignments of less than 1 ton, the goods being charged for according to weight.

Consignments of 1 ton and over, as well as vegetables, grain, fodder, manure, etc. in lots of less than 1 ton come under class 3 « carriage paid » or « carriage forward ».

For loads of 2 tons and over there is a competitive scale of rates in internal traffic for distances under 200 km. (124 miles), the charges coinciding with the ordinary rates at 300 km. (186 miles) and beyond. Up to 200 km., the rates for the « carriage paid » traffic according to this scale are the same as in classes 4 and 5 for full wagon loads.

Full wagon load traffic.

For traffic consigned in full wagon loads there are 6 ordinary classes : 4, 5, 6, 7, 8, 9, and an exceptional class U. Prior to the 1st October 1936, there was also a class 3 for full wagon loads, but this has been abolished under the new tariff.

The rates take into account the value of the goods, consignments being charged in accordance with the scales applicable to the class in which they are placed.

There are rates for 5-ton and 10-ton wagon loads, over 10 tons being charged at a lower rate than 5-ton consignments.

The charges are differential, the basic rates of the various scales being as shewn in the following table (in öre [0.01 kr.] per 100 kgr. [210 lb.]).

Distance.	Express goods.	Ordinary goods.								
	Truck loads.	Part loads.		Wagon loads						
	2*i*	1 (*)	3 (*)	4	5	6	7	8	9	U.
Fixed charge.	50	30	30	18	18	15	11	9	9	8
Charge per km. (*per mile*) :										
1 to 100 km. (*0.6* to *62 miles*).	2.00	1.50	1.50	0.90	0.90	0.75	0.55	0.47	0 40	0.32
101 to 200 km. (*62.8* to *124.3*).	1.30	1.50	0.90	0.50	0.50	0.40	0.32	0.24	0.24	0.24
201 to 300 km. (*124.9* to *186.4*).	1.00	1.50	0.50	0.87	0.40	0.30	0.25	0.23	0.22	0.22
301 to 500 km. (*187.0* to *310.7*).	0.60	0.60	. .	...	...	...	...	...	...	...
Over 300 (500) km. (*186.4* [*310.7*])	0.30	0.30	0.30	0.30	0.30	0.27	0.25	0.23	0.22	0.22

(*) « Carriage forward » only. 10 % less for « carriage paid » traffic.

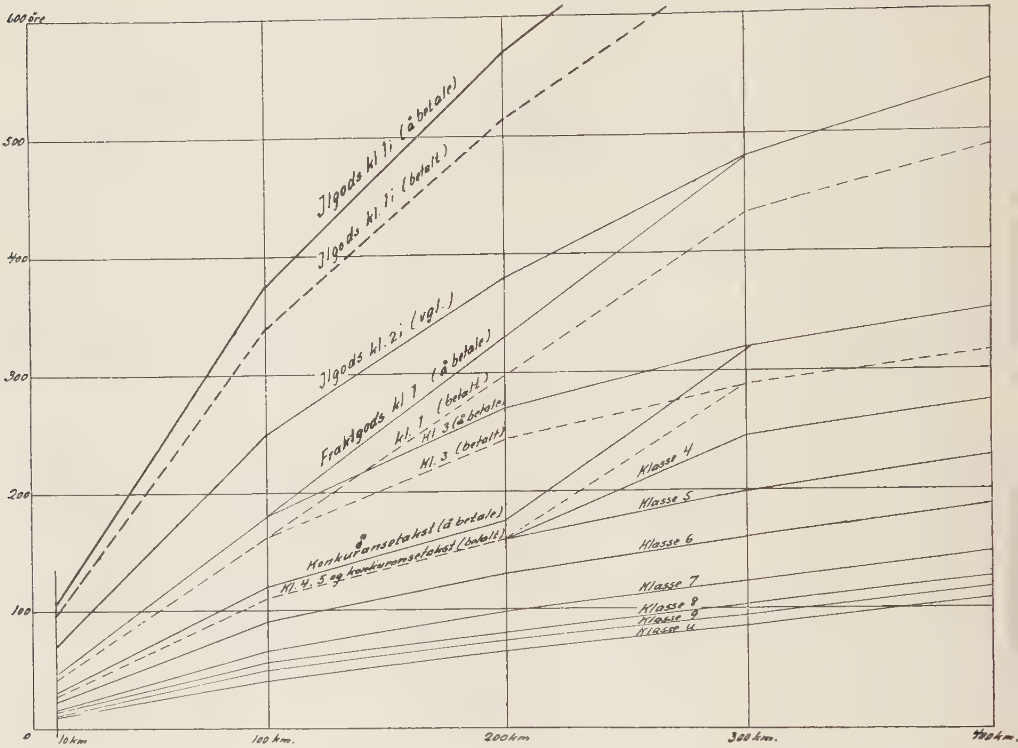
Subject to a minimum chargeable distance of 10 km., (6.2 miles), the actual charges proceed in steps of 2 km. (1.24 miles) up to 100 km. (62 miles), 5 km. (3.1 miles) from 101 to 500 km. (62.8 to 310 miles) and 10 km. (6.2 miles) above 500 km. Amounts are rounded off to the next öre.

The charges for express part loads sent « carriage forward » are 50 % over class 2*i*.

The following graph shews the difference between the tariff classes.

Loading and unloading of wagon load consignments devolve upon the consignor and consignee.

The fixed charge covers the station



Graph showing the goods rates.

Explanation of Norwegian terms :

Ilgods kl. 1*i* (å betale) = express goods class 1*i* (carriage forward). = Ilgods kl. 1*i* (betalt) = express goods, class 1*i* (carriage paid). — Ilgods kl. 2*i* (vgl) = express goods, class 2*i* (truck loads). — Fraktgods kl. 1 (å betale) = ordinary goods, class 1 (carriage forward). — Fraktgods kl. 1 (betalt) = ordinary goods, class 1 (carriage paid). — Kl. 4,5 og Konkuransetakst (betalt) = class 4 and 5 and « carriage paid » competitive rates. — Klasse = class.

charges, including loading and unloading in the case of part load traffic.

* * *

Flat rates for certain traffics.

There are flat rates on a per package basis irrespective of distance for consignments of fresh or salted herrings and other fish, kippered cod, mackerel, eggs, fruit, cheese, potatoes and cabbages, packed as specified.

In certain cases, however, there are two rates — one for distances under 600 km. (373 miles) and the other for distances from 601 to 1 000 km. (373.6 to 621 miles). Flat rates are quoted for both express and ordinary goods.

* * *

Extension of competitive rates.

The competitive rates have already been mentioned. For the conveyance of

part load traffic, agreements are made with firms using franking machines.

The simplicity of this way of calculating the cost of transport for small consignments makes it possible in a large measure to leave the traders to ascertain the rates themselves by means of the detailed scales of charges supplied. Actually all they have to do is to find out the exact amount from this scale.

The State Railways have made a series of private agreements with certain firms under which special charges are not applied and a certain rebate on carriage charges is allowed in return for an undertaking on the part of the firms to consign all their less than wagon load traffic by rail whenever the destination point is rail-served. The arrangement excludes short-distance traffic within a radius of 30 km. (18.6 miles) which may be delivered by the firms' own vehicles, also traffic for which for one reason or another the firms' clients insist on some other form of transport. All such cases, however, must be notified to the railway.

The firms are required to ascertain the freight charges themselves, the accounts thereof being recorded by means of franking machines which are installed at their premises and may be rented or purchased outright.

The carriage accounts are settled twice monthly, the amount payable being as indicated by the machine, less the agreed rebate.

The firms using franking machines enjoy the additional advantage that any uncertainty in the payment of carriage charges, which previously were paid currently in cash by messengers or clients, is avoided, and that the railway account can be ascertained at any moment from the machine.

A large number of agreements of this nature have been concluded, and the arrangement appears to be working very satisfactorily.

* * *

In internal traffic, the system of rates and charges does not include any maximum and minimum limits and there are no exceptional or groupage rates.

As regards groupage traffic the internal tariff contains the following clause :

« Two or more senders or two or more consignees may load into the same wagon, subject to only one of them and one consignee being shewn in the consignment note. »

Formerly a proportional reduction was granted in the case of large consignments but after the publication of the internal tariff of 1st October, 1936, these reductions have been successively discontinued.

The new tariff contains the following fidelity clause :

« The three lower classes, namely, Class 8 for a minimum of 5 tons per wagon and Classes 9 and U for a minimum of 10 tons (6 1/2 tons on narrow-gauge lines) are only available for traders loyal to the railway, i.e., traders who in general send their traffic by rail whenever the destination point is rail-served. »

As regards traders who only use the railway for their lower-rated commodities and send their higher-rated traffic by other forms of transport, the rate applied is Class 7 as a minimum in the case of 5-ton loads, and Class 8 for loads of 10 tons or paying for that weight.

* * *

Passenger traffic.

Four-day return tickets with a reduction up to 19 % were introduced on September 1st, 1935, for distances under 300 km. (186 miles), and the fast-train supplement has in most cases been discontinued.

* * *

Legislation.

Under the Act of 21st June, 1935, the rules relating to liability were modified in the direction of increased compensation as from 1st Januari, 1936, and the Ministry was empowered to regulate in greater detail the hours and conditions of labour in the road transport industry.

[621. 335 (.494)]

Class Ce 2/4 light electric motor coaches of the Bernese Alps Railway (Berne-Loetschberg-Simplon),

by L. LEYVRAZ,
Chief Mechanical Engineer, Berne.

The Bernese Alps Railway Company, Berne-Loetschberg-Simplon (B.L.S.), towards the end of 1935, put into service five light electric motor coaches with four pairs of wheels (two bogies), operating at 15 000 volts, single-phase current, 16 2/3 cycles per sec. These light motor coaches were not intended to provide supplementary services on the secondary lines of the B.L.S. (see map, figure 1) — because with the electric traction already in use on these lines since 1920 the trains are almost as frequent as on a main line — but to lighten the weight of the trains and increase the percentage of useful weight compared with the gross weight of the train.

Up to the present the electric traction on these lines has been effected by Ce 4/6 class locomotives with a tare

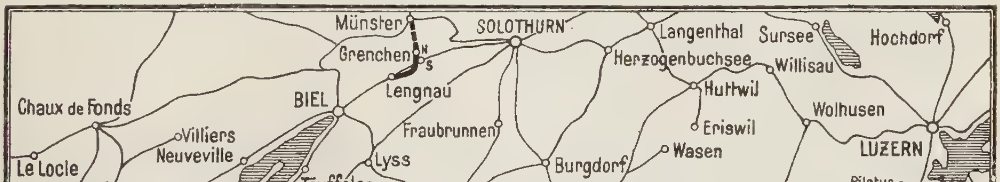


Fig. 1. — Map of the Bernese Alps (Berne-Loetschberg-Simplon) Railway.

weight of 70 tonnes (68.9 Engl. tons) and a power of 200 H.P. at a speed of 35 km. (21.7 miles) an hour. With the minimum admissible composition of 3 or 4 carriages of 15 tonnes (14.75 Engl. tons) tare weight, including one luggage-brake van, the total weight of the train was 125 to 130 tonnes (123 to 128 Engl. tons) and the useful load 10 tonnes (9.8 Engl. tons) at the most. The proportion of the useful load to the total load therefore was often only 7 to 8 %, which is obviously insufficient. Actually the average figures for the year on these lines were still more unfavourable, being about 6 %, which shews that the seats available were far from being completely filled, even if the composition of the trains in service is reduced to the minimum. It was necessary, therefore, to *reduce the gross weight* of the trains so that the ratio of useful weight to total weight might be higher. The resulting trains being much lighter consume less current in proportion, with a corresponding saving; furthermore the light-train staff can be reduced to the minimum (one, or at the most two employees) which again reduces the operating expenses. Now, the essential aim of the introduction of light motor coaches on the B.L.S. lines is the reduction of working costs.

These are the considerations which led the B.L.S. to order in the first place five light motor coaches, type Ce 2/4 (1), after consideration of tenders, from the following Swiss Companies : 3 motor coaches from the Winterthur Locomotive Works (S.L.M.) for the mechanical part and the Sécheron Works, Geneva, (S.A.A.S.), for the electrical part;

2 motor coaches from the Neuhausen Swiss Industrial Company (S.I.G.) for the mechanical part, and from the Brown-Boveri Company, Baden (B.B.C.) and the Oerlikon Works, Zurich (M.F.O.) for the electrical part.

The three Winterthur/Sécheron motor coaches have been allotted to the Spiez-Erlenbach (Zweisimmen), the Gürbetal (Berne-Belp-Thun) and the Berne-Neuchâtel direct lines.

The Neuhausen/Brown-Boveri motor coach has been allotted to the Loetschberg railway which in its turn handed it over to the Berne-Schwarzenberg line; finally the Neuhausen/Oerlikon coach has been allotted to the Berne-Neuchâtel direct line.

The following are the various characteristics of the different vehicles :

RAILWAY.	Coach.	Builders.	Overall length.	Number of places.	Horse power.	Tare, metric (*Engl.*) tons.
Gürbetal	Ce 2/4 691	S.L.M. Sécheron.	20.90 m. *(68' 7")*	93 seated 20 standing.	400	35.2 *(34.6)*
Spiez-Erlenbach. . . .	Ce 2/4 701	Do.	20.90 m. *(68' 7")*	Do.	400	35.2 *(34.6)*
Berne-Neuchâtel (direct).	Ce 2/4 726	Do.	20.90 m. *(68' 7")*	Do.	400	35.2 *(34.6)*
Berne-Neuchâtel (direct).	Ce 2/4 727	S.I.G. Oerlikon.	19.40 m. *(63' 8")*	65 seated 50 standing.	400	31.7 *(31.2)*
Loetschberg	Ce 2/4 787	S.I.G. Brown-Boveri.	19.40 m. *(63' 8")*	Do.	400	32.6 *(32.1)*

(1) Ce 2/4 = Third-class eight-wheeled electric motor coach with two driving pairs of wheels.

The five motor coaches each have a horse-power of 400, provided by two motors at a speed of 50 km. (31 miles) an hour. The maximum speed for all the motor coaches has been fixed at 90 km. (56 miles) an hour on account of the track conditions of the different lines. At the same time, during running trials with all the coaches the speed has been increased without trouble up to 100 km. (62 miles) an hour on heavier track, where this speed was allowed, amongst other places in the long Loetschberg tunnel (14.6 km. = 9.07 miles).

The tare per seat available is 312 kgr. (685.6 lb.) for the first three coaches, and 280 kgr. (617.3 lb.) for the last two coaches in the above table.

The following information about the construction of the different motor coaches will be of interest :

(1) *S.L.M. Winterthur/Sécheron motor coaches* (fig. 2).

These coaches have the following special features : The platforms at first provided at the two ends have been converted into small luggage compartments with moveable seats; an additional door has been provided at the end with a gangway to allow passage from the motor coach to a trailing vehicle; the non-smoking compartment contains 40 seats against 30 in the smoking compartment, which makes the coach 1.50 m. (4' 11") longer than the Neuhausen coaches.

The all-metal body is assembled by electric welding. It has an insulating interior lining. The floor is of linoleum on compressed cork and corrugated plate. All the seats are upholstered so as to offer the maximum comfort to the passengers (fig. 3). The large-paned windows allow unrestricted view along the whole of the body.

The bogies with wheels of 900 mm. (2' 11 1/2") diameter, in annealed cast steel, have a wheelbase of 3 m. (9' 10 1/8") (fig. 4). One of the bogies is

Fig. 2. — *Sécheron-Winterthur* light motor coach.

Fig. 3. — Interior of a motor coach.

driving, the other simply carrying. The frame is inside the wheels. The body rests on the bogie frame by means of longitudinal leaf springs, as is the practice in new carriage bogie construction. The axleboxes are roller bearing, which ensures the minimum running resistance. In fact, the coaches will start by gravity on the 1 in 500 to 1 in 333 gradients of certain stations if care is not taken to keep the brakes on. The suspension of the axles on the bogie frame is by means of strong helical springs.

The running of these motor coaches is very smooth and quiet, even at the maximum speed of 100 km. (62 miles) an hour.

A particular feature of the electrical equipment is that the transformer is situated on the roof in immediate proximity to the pantograph collector (fig. 5). In this way conduction of high-tension current is avoided. The graduation contactors are coupled to the transformers, so that even in the low-tension circuit in the interior of the coach there is only the current going from the self-induction coils to the reverser and thence to the two motors. From the point of view of curve negociation this very simple arrangement has the drawback of concentrating the vehicle weight at a point fairly high above the rail level. The effect of centrifugal force on small-radius curves has been compensated by a stabilising device, so that curves can be run

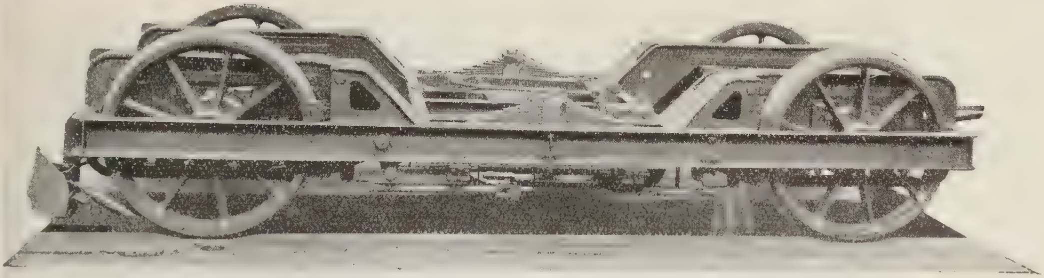


Fig. 4. — *Sécheron-Winterthur* bogie.

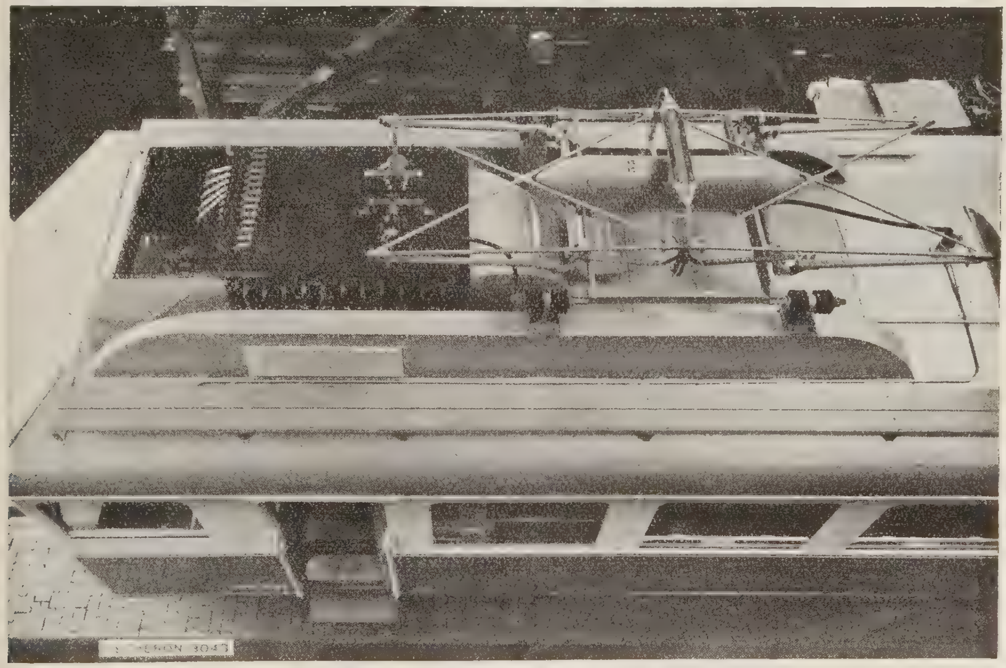


Fig. 5. — Arrangement of transformer on the roof.

through without any trouble up to the maximum speed authorised by the existing regulations, and even 5 km. (3.1 miles) an hour in excess of it.

The frame of the six-pole traction motors is welded throughout (fig. 6). Their power at the hourly rate is 200 H.P., corresponding to a speed of 50 km. (31 miles) an hour and a tractive effort of 1 000 kgr. (2 200 lb.). This tractive effort allows the haulage of loads up to 40 tonnes (39.4 Engl. tons), according to the profile of the line, without diminution of speed. The fact that it can haul a trailer has proved very useful, as the motor coach can be used even if the number of passengers exceeds its loading capacity and prevents undue crowding of

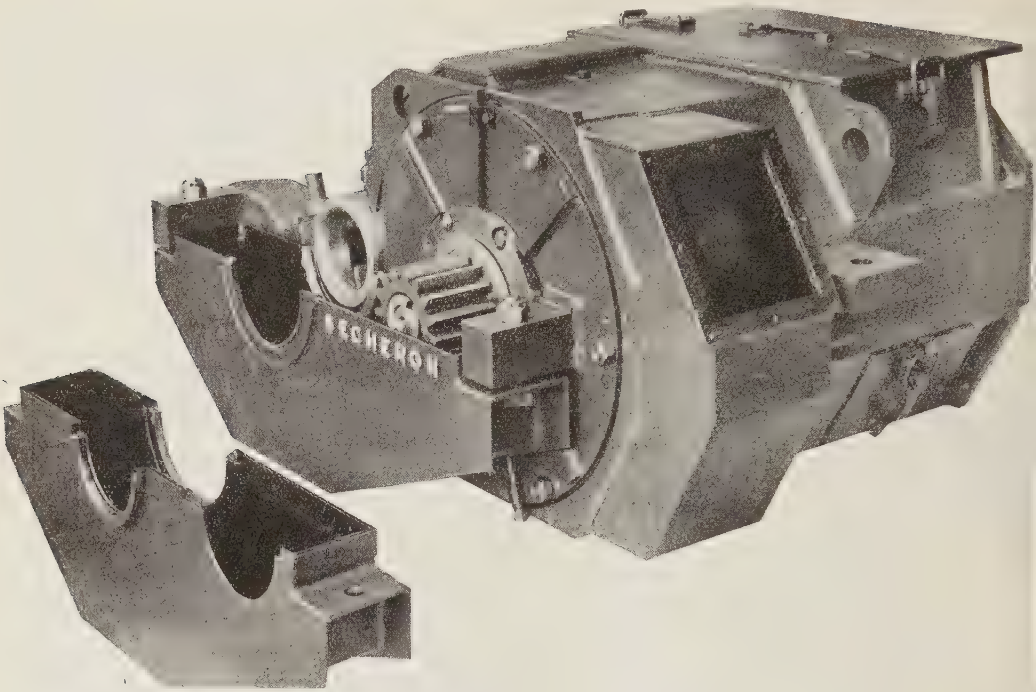


Fig. 6. — 200-H.P. motor, with completely welded frame.

passengers into the single vehicle. In fact, the service assigned to these motor coaches necessitates the frequent haulage of coaches, luggage vans and mail vans, as well as express goods vehicles.

The motor coaches are provided with hand brake, simple automatic Westinghouse brake, and electric brake. For the latter, the motors are excited by the alternating current, and feed into a fixed resistance in the roof, the braking effect being regulated by the variation of the current exciting the motors. With this brake, the speed of the motor coach on falling gradients can be regulated, and speed reduced on entering stations, so that the Westinghouse brake need only be used for stopping.

Heating and lighting are naturally arranged electrically following the normal Swiss practice (heating at 1 000 volts, lighting at 36 volts d.c.). Signal lamps of the Scintilla automobile beacon type are fitted, and the top signal light is changeable to red (authority for running). The lighting current is produced by a single-phase to d.c. converter group, connected with a nickel-iron SAFT 100 amp.-h. battery.

As it is intended primarily to work these motor coaches as single units with one man, a loud-speaker installation has been provided on the five coaches, so that the driver can announce the stations in advance without leaving his post.

Each motor coach is also provided with a safety device, consisting of a pedal and automatic brake relay, in case anything should happen to the driver.

(2) *S.I.G./Oerlikon and Brown-Boveri motor coaches.*

These coaches are 1.50 m. (4' 11") shorter than the Winterthur coaches, the non-smoking compartment having only 30 seats like the smoking compartment. There are large platforms at the two ends, about 2.80 × 2.80 m. (9' 2" × 9' 2") for either standing passengers, luggage or post parcels. The ends of the coaches are rounded off so as to reduce air resistance, and the windows of the platforms are sloped towards the back, so that the whole arrangement is streamlined to some extent (fig 7).

The bodies are all-metal, the underframe and sides being arc-welded throughout, and then assembled and fastened by the roof arches, to which a soft iron plate is welded.

The body thus assembled and finished was tested in the presence of engineers of the Federal Traffic Department with various loads, which demonstrated the rigidity and strength of this form of construction.

The floor is also in linoleum, on compressed cork and corrugated plate.

The floor is 980 mm. (3' 2 5/8") above rail level, and is reached by three steps, the bottom one of which can be tipped up during running, as it comes outside the constructional gauge.

The reduced height of the floor compared with ordinary coaches greatly facilitates and speeds up the entry and exit of passengers.

The bogies, with a wheelbase of 2.80 m. (9' 2") in the case of the Neuhausen/Oerlikon coach (No. 727) (fig. 8), and 3.40 m. (11' 2") in the case of the Neuhausen/Brown-Boveri coach (No. 787), are of robust construction, electric welding having been used exclusively.

The body also rests on two strong longitudinal leaf springs; the bogie pivot in this case is in the form of a large-diameter supporting ring for the body, and is connected to the longitudinal suspension springs by very strong arms, forming a bogie bolster. The body rests on the ring by means of four bronze segments.

Fig. 7. — *Oerlikon-Neuhausen* light motor coach.

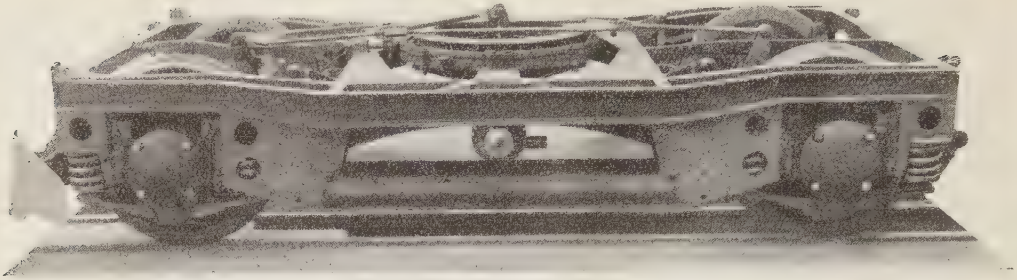


Fig. 8. — Bogie of *Oerlikon-Neuhausen* motor coach.

The axles are of the light type, hollowed, with light 80-cm. (2' 7 1/2") diameter tyred wheels.

The bogie frames are fitted with double suspension, ensuring by this fact, very smooth running at all speeds.

The bogies of the Neuhausen/Brown-Boveri coach (No. 787) (fig. 9), intended for the Berne-Schwarzenberg Railway, a very tortuous line with curves of as little as 180 m. (9 chains) radius and 1 in 29 gradients, are fitted *with guided pairs of wheels*. These bogies are a little more complicated in design and are composed of a main frame A (outline, fig. 10) taking the body supporting ring with longitudinal suspension springs and two pivots for the articulation of the frames B and C of the two pairs of wheels and their radial positioning on the curves.

The two frames B and C are also connected with each other and with the body by a SFEDR gear (fig. 10) which progressively displaces the pairs of wheels till they have taken up a radial position to the curve. Each bogie has a guiding pair of wheels (outer pair) and a driving pair provided with a 200-H.P. electric motor. Tests carried out in the laboratory of the Neuhausen Swiss Industrial Company, as well as on the running line, have shewn that the pairs of wheels take up an exactly radial position relatively to the curve.

This arrangement, patented by the Neuhausen Swiss Industrial Company, SIG/VRL system, is exceptionally favourable to the good running of the motor coach through curves, and comparative trials with other light motor coaches on this line have shewn that the vehicles with rigid pairs of wheels do not run through curves nearly as smoothly as those with guided pairs of wheels.

This device also increases the life of both tyres and rails to a large extent, and

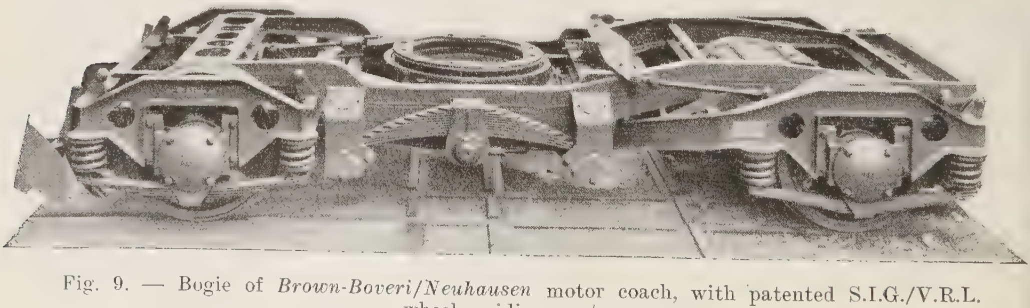


Fig. 9. — Bogie of *Brown-Boveri/Neuhausen* motor coach, with patented S.I.G./V.R.L. wheel guiding system.

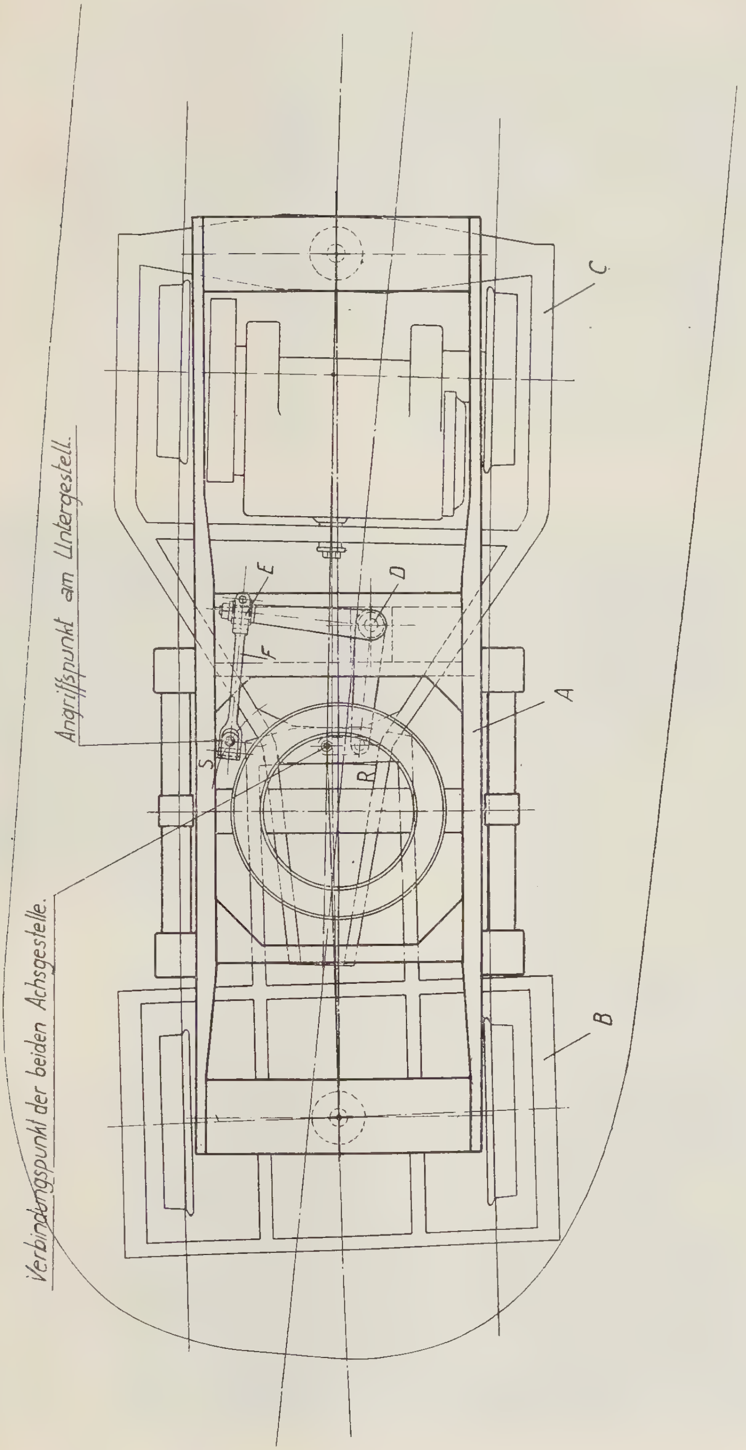


Fig. 10. — Plan of bogie with guided pair of wheels, S.I.G./V.R.L. system.

Note. — Verbindungspunkt der beiden Achsgestelle = Articulation of the two axle frames. — Angriffspunkt am Untergestell = Point of attachment to the coach body.

the maintenance of the track will also benefit by it.

In fact, after running nearly 100 000 km. (62 000 miles) on the tortuous Berne-Schwarzenberg line, the tyres shewed only 1/2 mm. (0.0195") wear, and the flanges practically no wear.

The electrical gear of the two Oerlikon and Brown-Boveri coaches is situated in the front and rear of the vehicles on the platform in front of the driver's seat. The transformer with speed regulator is on one side and the compressor, the converter — and on the Oerlikon coach, another speed regulator — on the other side (figs. 11 and 12).

On the latter coach the speed regulator is hand-operated, as is the reverser; on the Brown-Boveri coach the regulator is worked by a servo-motor operated by a small fly-wheel.

The motors are also of 200 H.P., giving at a speed of 60 km. (37.3 miles) an hour a tractive effort of 1 000 kgr. (2 200 lb.) per pair of wheels at the tread.

The Oerlikon and Brown-Boveri motors are of the same construction, and are six-pole. Here also the tractive effort provided by the motors is sufficient to allow the coupling of trailers up to 40 tons.

During the trial runs the following accelerations have been obtained from standing, with the motor coach alone :

On the level, a speed of 90 km. (56 miles) an hour is reached in 55 seconds after running 800 m. (2 624');

On a 1 in 55 gradient, a speed of 70 km. (43.5 miles) an hour is reached in 64 seconds, after running 700 m. (2 297');

On a 1 in 45 gradient the same speed is reached in 73 seconds after running a distance of 770 m. (2 526').

The motors can brake electrically; for this purpose they are energised by direct current provided by the converter set.

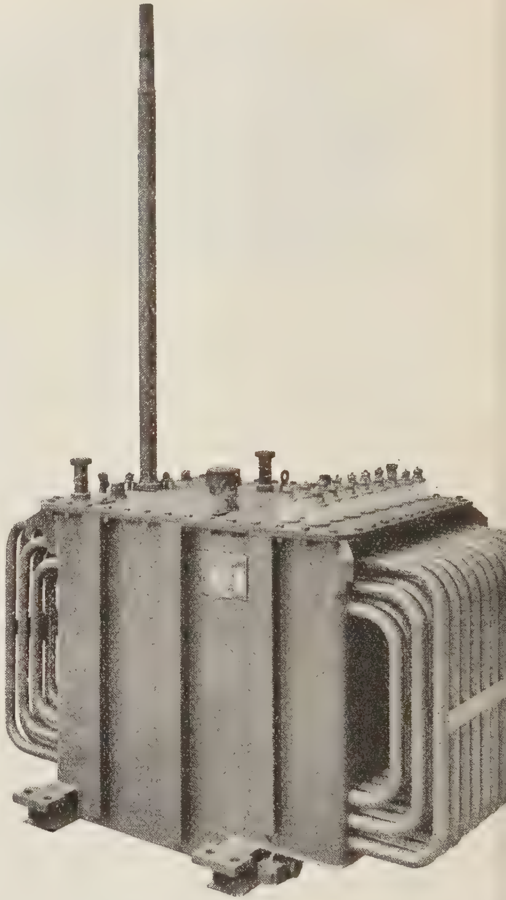


Fig. 11. — *Oerlikon* single-phase, 16 2/3-cycle 160-kVa. stepped transformer.

The braking power, therefore, is obviously higher than on the Sécheron coaches, and the vehicle speed can be slowed down more on entering stations, but this is not done, as the Westinghouse brakes must be used in the same way on all the motor coaches.

As regards the Westinghouse brake, the safety pedal, lighting and heating, the two motor coaches are exactly similar to the Sécheron/Winterthur coaches.

The driving compartments of all the vehicles have been arranged as uniform-

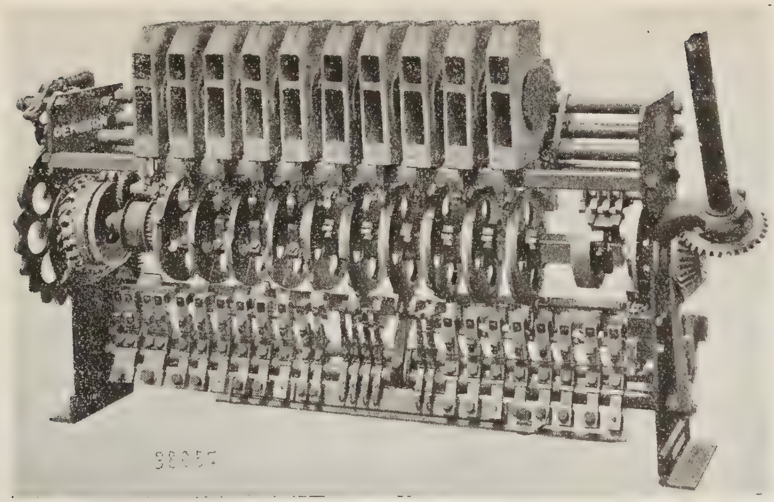


Fig. 12. — *Oerlikon* controller, for running and braking, with direct control.

Fig. 13. — *Sécheron-Winterthur* driver's compartment.

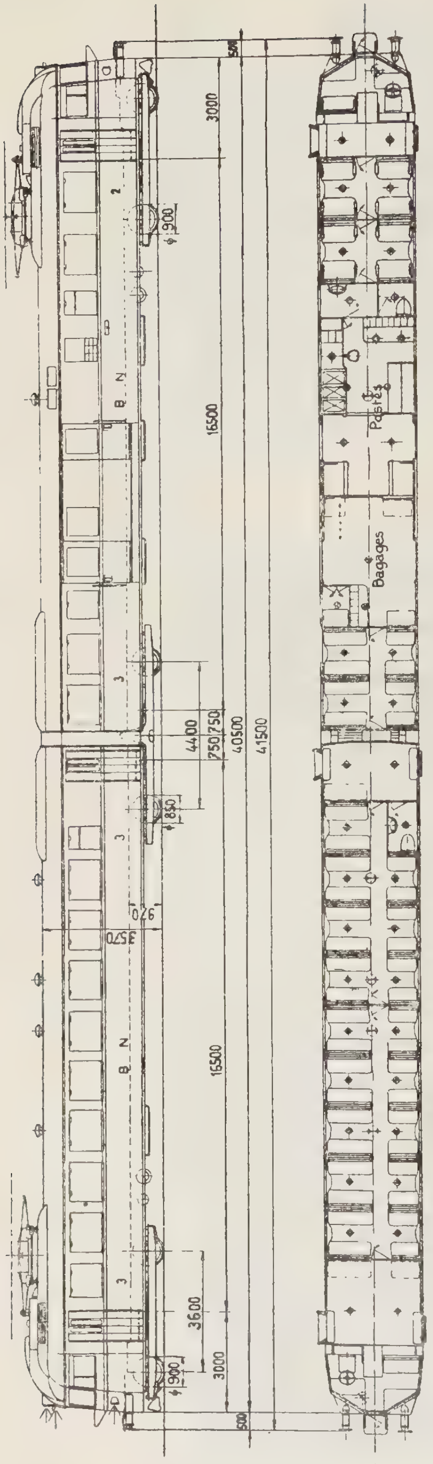


Fig. 14. — Light articulated train of the Berne-Loetschberg-Simplon Railway.
Passengers carried : 180. — Tare : 67.5 t. (66.4 Engl. tons)

ly as possible, so that the drivers can use them all without difficulty (fig. 13).

The five motor coaches are now in regular service on the lines to which they have been allotted. They replace the ordinary trains whenever these were found to be too heavy for the traffic. With the present services they cover a total of 1 783 km. (1 108 miles) on lines having lengths of only 21, 34, 36 and 43 km. (13.0, 21.1, 22.4, and 26.7 miles).

Their high speed and rapid acceleration have allowed at the same time a shortening of running times. In spite of increased mileages, since the introduction of these light vehicles, the consumption of electric current has decreased by 5 to 10 %, according to the lines on which they are operated.

The public appreciate these elegant, comfortable and fast vehicles, and this doubtless has contributed to the retention of passengers who were tempted to abandon railway transport in favour of its competitors.

The light motor coaches often are used during the summer and during the winter sports seasons for the transport of parties who would otherwise travel by road motor coach.

In view of the success of these light electric motor coaches and their experience with them, the Bernese Alps Railway Company (B.L.S.) has ordered three light trains composed of two coupled motor coaches on three bogies, with the position of the pairs of wheels controlled by means of the S.I.G./V.R.L.gear, two single motor coaches similar to those already supplied by Sécheron/Winterthur (fig. 2), and another light train consisting of a coupled motor coach and trailer on three bogies, — one driving and two carrying — for the Berne-Schwarzenberg line. These vehicles should be delivered during 1938.

[621.132.8 (.73)]

Steam self-propelled passenger train of the New-York, New Haven and Hartford Railway (*).

Fig. 1. — Exterior view of power end showing condenser on roof, power truck and removable coupler.

The New York, New Haven and Hartford Railway has recently placed in service a steam self-propelled streamlined modernized passenger train, the power equipment for which was furnished by Besler Systems, Davenport-Besler Corporation, Davenport, Iowa.

Two twenty-year old steel coaches were remodelled for this train. The train as completed has a :

Total horsepower	550
Horsepower at rail	500
Seating capacity	152
Baggage capacity	12 ft.-3 000 lb.
Overall length, ft. and in.	163'2½"
Total weight, ready to run, lb.	303 600
Distributed weight, power truck, lb.	104 000
Trailer truck, power car, lb.	67 000
Trailer, inside truck, lb.	65 000
Trailer, leading truck, lb.	65 600
Weight light train, lb.	296 100
Weight power plant and control, lb.	32 700 approx.
Including truck	48 738

(*) This article should be considered as part of the report on Question IV (Rail motor cars) of the Agenda of the Paris Congress (June 1937), drawn up by Mr. E. Wanamaker, Electrical Engineer, Chicago, Rock Island and Pacific Railway. *(Bulletin of the Railway Congress,* April 1937, p. 857/1).

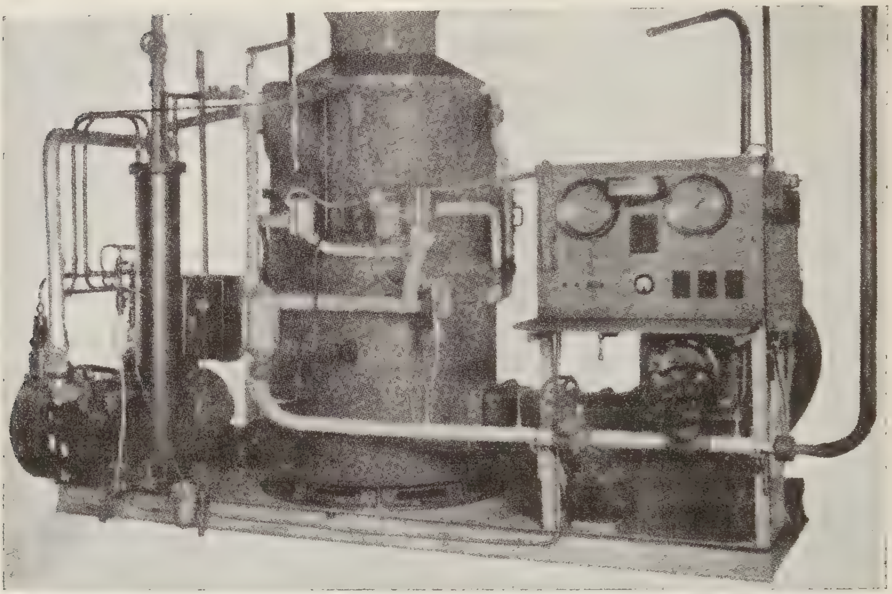


Fig. 2. — Boiler room units as arranged for testing.

The boiler is of the continuous-flow non-water level type. It has no drums nor headers, but is a continuous tube from inlet to the throttle; the water enters at the top and passes down through the pancake coils where it is heated and changed to steam, then through the helical coils at the bottom, surrounding the combustion space, and passes to the superheater coils, just above the fire-box, finally emerging as superheated steam.

The boiler is fully equipped with automatic safety devices to protect it against empty water tanks or other contingencies. It is 4 feet in diameter and 6 ft. 5 in. in height. The minimum tube diameters are 3/4 inch and the maximum tube diameters are 2 1/4 inch. The inner boiler casing is made of corrosion-resisting Inconel, and the outer casing, separated from the inner casing by insulating brick, is made of sheet iron.

The engines. — There are two direct two-cylinder compound engines each having cranks pressed on to extensions of the axle stub outside of the journal bearings. The high-pressure cylinder is 6 1/2 inches in diameter and the low-pressure cylinder is 11 inches in diameter. Both cylinders have a 9-inch stroke. These are conventional double-acting compound engines, with piston valves. The crossheads are cylindrical in shape and are made of cast steel with babbited shoes. All bearings are of the roller type, and all working parts are machined all over.

The valve mechanism is a Stephenson link motion arranged to be operated pneumatically and to give two positions forward and two positions reversed. All piston and valve rods are made of Nitroalloy, and the wrist pins are of the full floating type, made of Nitroalloy running in phosphor-bronze bushings. The lubrication is accomplished by splash

within a sealed crank case, and in addition a circulating plunger pump is provided to assure lubrication at low speeds. The cylinder relief valves are air operated.

The burner is of the pressure atomizing type of construction. It automatically meters the fuel in proportion to the flow of air which is delivered by a multivane type blower. Adjustment is not necessary due to change of altitude or change in draft pressure, and the burner automatically compensates for changes in air flow caused by entering tunnels, high speeds, or cross winds, — in every case metering the correct amount of fuel. Ignition is secured by a high-tension electric spark.

Auxiliary engine. — The auxiliaries are driven by a two-cylinder 90-degree V-type double-acting steam engine. The two water pump drives are integral with the main crank shaft. The auxiliary steam engine drives the electric generator through V-belts. The generator supplies current for lighting and ventilating, and for the requirements of the power plant. The auxiliary engine also drives the air compressor and the forced-feed main-engine lubricators. This engine operates at a back pressure and exhausts into the train heating-line. When train heating is employed the power used to drive the auxiliaries represents only 2 % of the boiler output.

Condenser. — The condensers are of the fin and tube type, placed on the roof of the car. Propeller type fans driven by individual exhaust-steam turbines are located adjacent to the condenser cores on the roof and draw air through the cores, discharging it upward.

The turbine speed inherently varies in proportion to the steam flow producing the optimum relation between air flow and condenser load at all outputs.

Train controls. — The train has pneumatic duplicate controls so that it can be operated from either end.

Power truck. — The one-piece main frame weighs approximately 12 000 lb. The overall length is 17 ft. 8 in. and the total width over the cylinder lagging covers is 9 ft. 5 in., being well within the clearance diagrams of any railroad of the U.S.A. The wheel base is 11 ft. 6 in.,

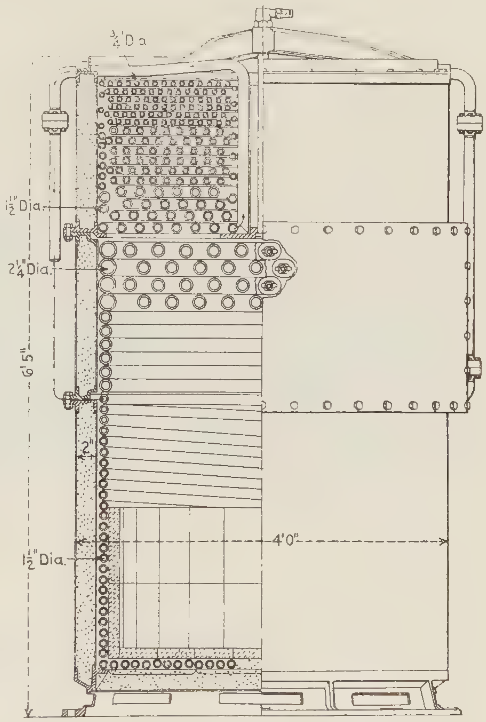


Fig. 3. — Cross section of boiler.

and Bethlehem low-carbon molybdenum wheels with chrome-vanadium axles are used.

The truck frame supports the car body through a conventional swing bolster and elliptical spring plank. Simplex clasp brakes are used, with two brake cylinders mounted on the truck.

Westinghouse slack adjusters are provided, and there are two brake shoes on each wheel. The over-riding truck frame is a large four-legged spider, and the engine yoke frames, which ride with and take their alignment from the axles, are attached to the truck frame by ball joints. The total weight of the power truck is 35 000 lb. complete.

The manufacturers of this equipment state they have had no trouble with lubrication, condensers, or boilers.

They feel that the ensuing year will demonstrate the practicability of this form of power plant for rail service; in any event this power plant is well worthy the investigation and study of the railway fraternity.

RECENT DEVELOPMENTS
IN RAILWAY PRACTICE.

[625. 232 (.42) & 656. 222.1 (.42)]

The "West Riding Limited" train for the West Riding-London high-speed service,
London and North Eastern Railway.

In continuation of their policy of introducing light fast trains between London and important provincial cities the London & North Eastern Railway Company, on Monday, September 27th, inaugurated a new high-speed service between the West Riding of Yorkshire and London, King's Cross.

The train provides an additional service in each direction and runs daily from Mondays to Fridays, leaving Bradford (Exchange) at 11.10 a.m., Leeds (Central) at 11.31 a.m., and arriving at King's Cross at 2.15 p.m. In the opposite direction the train leaves King's Cross at 7.15 p.m. and reaches Leeds at 9.53 p.m. and Bradford at 10.15 p.m. The time taken for the journey between Bradford and London is 3 h. 5 m., giving an overall average speed in both directions of 63.3 m.p.h., whilst the non-stop journey between Leeds and London is performed in 2 h. 44 m. at an average speed of 67.9 m.p.h. The return journey between King's Cross and Leeds is traversed in 2 h. 43 m., at an average speed of 68.4 m.p.h.

As in the case of the « Silver Jubilee » and « Coronation » trains, the high average speed is attained by fast speeds up hill and not by excessive speeds on falling gradients.

The section timings and average speeds are shewn in detail in the following table :

Point to point mileages, running times and speeds.
King's Cross, Leeds and Bradford.

Distance from Bradford. miles	chns.	STATION.		a. m.	Point to point. Time, minutes.	Distance, miles	chns.	Speed, m. p. h.
		Bradford Exchange	dep.	11.10	...	...	...	...
2	0	Laisterdyke	pass.	11.16	6	2	0	20.0
9	40	Leeds Central	arr.	11.27	11	7	40	40.9
			dep.	11.31	...	...	...	...
14	60	Ardsley	pass.	11.41	10	5	20	31.5
19	40	Wakefield Westgate	»	11.47	6	4	60	47.5
39	20	Doncaster	»	12. 6	19	19	60	62.4
56	47 3/4	Retford	»	12.21	15	17	27 3/4	69.0
75	8 3/4	Newark	»	12.36	15	18	41	74.1
89	60 1/2	Grantham	»	12.48	12	14	51 3/4	73.2
118	68	Peterborough North	»	1.11 1/2	23 1/2	29	7 1/2	74.2
136	27 1/4	Huntingdon	»	1.26 1/2	15	17	39 1/4	70.0
163	23 1/4	Hitchin	»	1.47 1/2	21	26	76	77.0
177	42 1/2	Hatfield	»	1.58 1/2	11	14	19 1/4	77.75
195	17	King's Cross	arr.	2.15	16 1/2	17	54 1/2	64.29
Distance from King's Cross. miles	chns.			p. m.				
		King's Cross	dep.	7.10	...	...	...	...
17	54 1/2	Hatfield	pass.	7.28 1/2	18 1/2	17	54 1/2	57 3
31	73 3/4	Hitchin	»	7.39 1/2	11	14	19 1/4	77.7
58	69 3/4	Huntingdon	»	7.58 1/2	19	26	76	85.1
76	29	Peterborough North	»	8.13 1/2	15	17	39 1/4	70.0
105	36 1/2	Grantham	»	8 37 1/2	24	29	7 1/2	72.7
120	8 1/4	Newark	»	8.49 1/2	12	14	51 3/4	73.2
138	49 1/4	Retford	»	9. 4 1/2	15	18	41	74.0
155	77	Doncaster	»	9.19	14 1/2	17	27 3/4	71.5
175	57	Wakefield Westgate	»	9.38	19	19	60	62.77
180	37	Ardsley	»	9.44 1/2	6 1/2	4	60	43.8
185	57	Leeds Central	arr.	9.53	8 1/2	5	20	37.1
			dep.	9.57	...	...	...	...
193	17	Laisterdyke	pass.	10.10	13	7	40	34.6
195	17	Bradford Exchange	arr.	10.15	5	2	0	24.0

Overall average speed.

Bradford-King's Cross : 195 miles 17 chns. in 3 h. 5 m. = 63.3 m. p. h.
Leeds-King's Cross : 185 miles 57 chns. in 2 h. 44 m. = 67.9 m. p. h.
King's Cross-Bradford : 195 miles 17 chns. in 3 h. 5 m. = 63.3 m. p. h.
King's Cross-Leeds : 185 miles 57 chns. in 2 h. 43 m. = 68.4 m. p. h.

Entirely new rolling stock for this service has been built at the Doncaster Works of the Company to the designs of the Chief Mechanical Engineer, Sir Nigel GRESLEY, C.B.E., to whom we are indebted for the present information.

Two new streamlined *Pacific* locomotives of the type used on the other L.N.E.R. high-speed trains have also been built at Doncaster, being similar in characteristics and appearance to the engines named after the Dominions, which are used on the « Coronation » expresses. The names chosen for these two engines are « Golden Fleece » (No. 4495) and « Golden Shuttle » (No. 4496).

The leading dimensions are as follows :

Length over buffers . .	71′ 0 3/8″.
Weight in working order.	167 tons.
Boiler pressure	250 lb. per sq. in.
Diameter of driving wheels	6′ 8″.
Cylinder diameter . .	18 1/2″.
Stroke	26″.
Tractive effort	35 500 lb.

The corridor tender follows the general scheme of streamlining and carries 8 tons of coal and 5 000 gallons of water.

The train is streamlined throughout with india-rubber fairings covering the gaps between the carriages in order to reduce the wind resistance, and consists of four pairs of twin carriages, as shewn on the diagram, giving accommodation for 48 first-class and 168 third-class passengers, the total length over buffers being 530' 3 3/4".

The formation leaving London is as shewn below :

	Seats.	*Weight.* T.	C.	Q.
Engine				
Brake third	24	62	18	3
Open third	42			
Kitchen third	15	74	11	2
Open third	42			
Open first	24	65	18	1
Open first	24			
Kitchen third	15	74	15	1
Open brake third. . . .	30			
		278	3	3

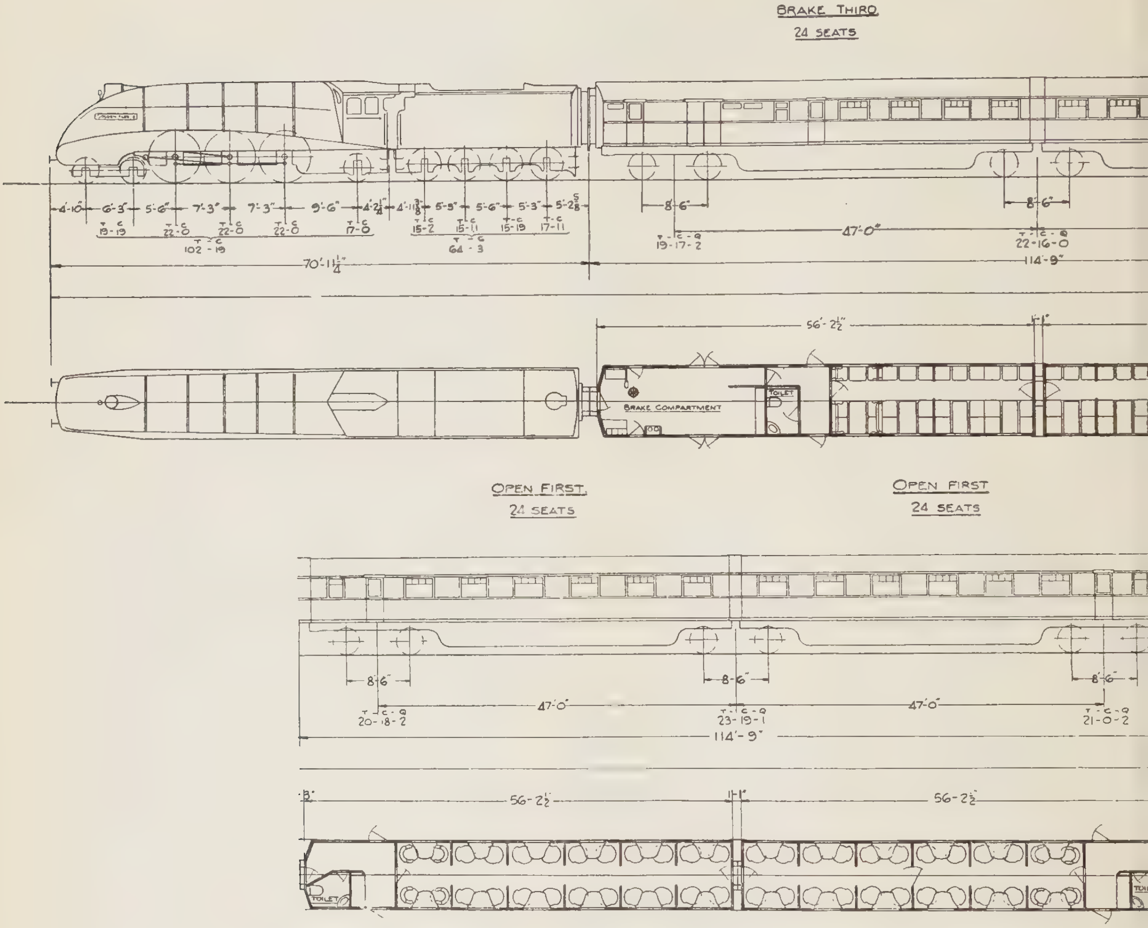
The general layout of the train is similar to that of the « Coronation » trains, being composed entirely of open saloon carriages each 56' 2 1/2" long over body and 9' 0" wide over mouldings. Pullman vestibules and buckeye couplings in accordance with the Company's standard practice are provided at each end of the twin units.

The whole of the seats throughout the train are numbered and may be reserved, and it will be seen from the layout of the train that no separate restaurant-car accommodation is provided and each passenger can, therefore, take meals at the seat which is allocated for the journey.

The exterior appearance of the train is of a striking character, the upper portion of the body side being in Marlborough blue and the lower portion in Garter blue. Synthetic paints have been employed throughout. Aluminium paint has been used for the roofs of the vehicles, whilst the skirting below the underframe and the bogies are finished in black paint.

The bodies of the carriages have been framed in teak and panelled with steel plates. All exterior fittings and mouldings are of stainless steel and the name « West Riding Limited » has been placed in stainless steel letters on the sides of each vehicle.

To ensure a quiet interior the whole of the body sides and roof are insulated with asbestos acoustic blanket. Special attention has been given to the floors. In addition to a 1/2" sheet of sponge indiarubber under the carpet and hair felt between the floorboards, the whole of the underside of each vehicle has been insulated by means of sprayed asbestos supported on dovetailed steel sheeting. The sound proofing has been further enhanced by the interior finish employed, the whole of the inner walls and ceilings being covered in Rexine. The windows are formed of double glass with an in-



The « West Riding Limited »

Seats for 48 first class pass

Total weight behi

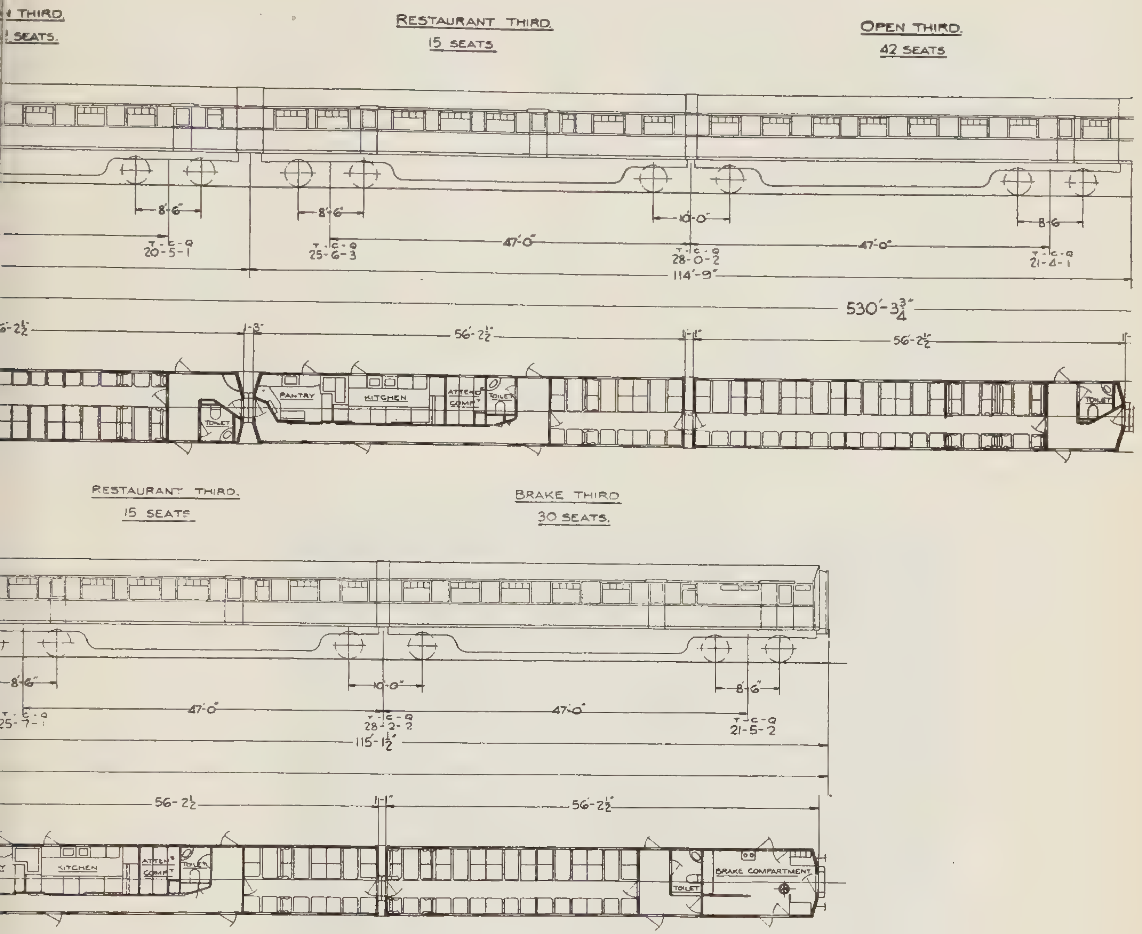
sulating space between. To exclude noise at the articulated ends, the gangways are lined with felt.

The bodies are mounted on steel underframes which have been fabricated by means of electric welding and comfortable riding has been ensured by the provision of compound bolster bogies.

Every effort has been made to provide the maximum possible comfort for the individual passenger. The arrangement of the interior of the train is unusual and gives the privacy usually associated with compartment carriages, whilst retaining the advantages and spaciousness of open vehicles.

The first-class saloons have been divided into sections by means of partitions, each section seating four passengers, two on either side of a central gangway, whilst the provision of ornemental screens projecting from the partitions gives an alcove effect.

Fixed tables are provided and the



and North Eastern Railway.

168 third class passengers.
278 t. 3 cwt. 3 q.

chairs are arranged to swivel, enabling the passenger to sit normally at the table at meal times and to turn away from the table when so desired. The tables are specially shaped to suit the swivelling chairs and the tops are covered with glass under which tapestry is placed to tone with the general scheme.

The decoration of the interior of the coaches reflects a marked advance on conventional practice and has been designed for the L.N.E.R. Company by Mr. Murray Adams Acton of Messrs. Acton Surgey Ltd., 3, Bruton Street, London, W. 1.

The originality of the schemes precluded the use of more or less standardised designs of fittings. The small fittings, such as racks and lights, have been specially manufactured and designed in materials to suit the character of the decoration.

The freshness and pleasant atmosphere of the colour schemes, and the rest-

fulness of the seating and planning, in conjunction with the installation of a modern form of air-conditioning, provides a remarkable advance and improvement in travel comfort.

The details of the decoration in each of the saloons are given below.

The first-class cars are lined with Rexine, the surface of which has a texture giving a fine stippled effect in a blue colour with brown and silver Rexine below. The tones selected have been specially matched and prepared in the Rexine by Messrs. Imperial Chemical Industries Ltd. The lower portions of the walls are decorated by the application of panels and ornamental features in Alumilited aluminium and the panels frame a special process of embroidery developed by Messrs. Acton Surgey Ltd. An Alumilited finish is also employed for the aluminium architraves at the doorways and for the decoration of the screens on each side of each doorway opening. The chairs are upholstered in blue uncut moquette, each chair being finished in blue braid; the carpet is of powder blue. Each window is framed in black ebonised woodwork and is provided with curtains of silk brocade suspended beneath the net rack, The rack is of aluminium, designed to harmonise

with the rest of the compartment and incorporates a light fitting at each end to give an individual light to each passenger. A further lamp in an Alumilited aluminium fitting is provided in the centre of each section.

The third-class saloons are divided by cross partitions into sections of six, twelve or fifteen passengers each. The upper portion of the walls and the ceilings are covered in stone coloured Rexine and the lower portion in Rexine having a shagreen finish. The junction is covered with an ornemental aluminium fret, the Rexine under portions of the fret being picked out in crimson. The doors which are of the darker Rexine are outlined in crimson and decorated in aluminium. The upholstery is of fawn uncut moquette whilst green carpets are provided mounted as in the first class saloons on sponge rubber 1/2" thick. Four passengers are seated at one side of the gangway and two on the other in each section, and to facilitate movement in and out of the large seats the double tables are provided with hinged side flaps.

Lighting fittings similar to those in the first-class compartments are provided, one lamp being fitted in each passenger section.

In order to facilitate the service of meals to all seats in the main portion of the train, two kitchens have been provided, each equipped with electric cooking apparatus of the most modern type specially designed for this service by Messrs. J. Stone & Co. and supplied by Messrs. Henry Wilson & Co. of Liverpool. The equipment in both kitchens is identical and consists of the main cooking range, comprising roasting and steaming ovens, two grills and a boiling table having four hot plates. A separate fish fryer is also provided and a vegetable boiler is arranged near the electrically heated sinks on the body side. An automatic water boiler including coffee and milk urn, manufactured by Messrs. W. M. Still & Co., is arranged alongside the hot cupboard on the corridor partition and an automatic refrigerator, having separate compartments for iced wines, butter, cheese and general provisions, is also fitted.

The necessary power is obtained from two 10-kw. axle-driven generators suspended under each kitchen car in accordance with the L.N.E. standard practice and supplies power at 180-220 volts. An Exide-Ironclad double battery of 210 ampere-hours capacity is provided on each car for use when the train is standing.

The usual pantry accomodation is provided and in this connection it should be noted that the table linen, glass, crockery and silver is of distinctive design in keeping with the special character of the train.

A particular feature of the whole train is the wide corridors and ample circulating space at the ends of the carriages, permitting easy circulation of passengers joining and leaving, and recognising that passengers travelling on these trains will take more luggage than that required for shorter journeys, luggage racks have been provided in the spacious entrance vestibules.

The first-class lavatories are decorated in stippled green Rexine, coloured washbowls and hoppers being provided to match . The fittings are chromium plated and a full length mirror is also provided. The hot water apparatus is heated by means of steam in the winter time, whilst in the summer, heat is obtained from an immerser heater supplied from the train lighting dynamos. The water supply to the washbowls is controlled by electrically-operated valves conveniently situated above the bowls. The floor is covered with Korkoid to match the walls.

The third-class lavatories are fitted in a similar manner, except that the prevailing tone is yellow.

The train is fitted throughout with a system of pressure ventilation and heating supplied by Messrs. J. Stone & Co., by means of which filtered air, heated to a comfortable temperature and thermostatically controlled, is supplied to the carriages at floor level, and grilles in the lighting fittings in the roof connecting with ducts leading to large extractor ventilators enable the air in each vehicle to be completely changed every three minutes. Direct ventilation is also obtained by means of a sliding shutter ventilator above each side window.

The guards' compartments at both ends of the train are fitted with electric food heaters and the necessary switches for the control of the electric lights throughout the train.

[625. 232 (.42) & 656. 222.1 (.42)]

The "East Anglian" train for the Norwich-London service,

London and North Eastern Railway.

On Monday, September 27th, a new fast service was inaugurated by the London & North Eastern Railway Company between Norwich and London, Liverpool Street, and an entirely new six-coach train has been built for this purpose at the York Works of the Company to the designs of Sir Nigel GRESLEY, C.B.E., the Chief Mechanical Engineer.

The train, which is named « East Anglian », runs daily from Monday to Friday in each direction, leaving Norwich at 11.55 a.m. and Liverpool Street at 6.40 p.m., completing the journey between the two cities in 2 h. 15 m. The overall average speed between London and Norwich, including a 4-minute stop at Ipswich, is 51 m.p.h. and between London and Ipswich 51.6 m.p.h.

Owing to the difficult nature of the route between London and Norwich, it has not been possible for the train to be timed at such high speeds as to justify the cost of streamlining the whole train. It has therefore been decided to streamline the locomotives only. Two 4-6-0 engines of the B. 17 type have been streamlined for service on this train and named « East Anglian » (No. 2859) and « City of London » (No. 2870).

The section timings and average speeds are shewn in the following table :

Point to point mileages, running times and speeds.
Liverpool Street and Norwich.

Distance from Norwich.		STATION.			Point to point			
miles	chns.			a. m.	Time, minutes.	Distance, miles	chns.	Average speed, m. p. h.
		Norwich	dep.	11.55	...	...	...	...
14	33	Tivetshall	pass.	12.14	19	14	33	45.5
34	27	Stowmarket	»	12.33 1/2	19 1/2	19	74	61.3
46	18	Ipswich	arr.	12.46	12 1/2	11	71	57.0
			dep.	12.50	...	...	...	...
55	42	Manningtree	pass.	1. 3 1/2	13 1/2	9	24	41.3
63	24	Colchester	»	1.12 1/2	9	7	62	51.8
76	31	Witham	»	1.26	13 1/2	13	7	58 1
85	17	Chelmsford	»	1.35	9	8	66	58.8
94	63	Shenfield	»	1.46	11	9	46	52.2
105	0	Chadwell Heath . . .	»	1.56	10	10	17	61.2
110	74	Stratford	»	2. 2	6	5	74	59.25
114	77	Liverpool Street . . .	arr.	2.10	8	4	3	30.2
Distance from Liverpool street.								
miles	chns.			p. m.				
		Liverpool Street . . .	dep.	6.40	...	...	...	...
4	3	Stratford	pass.	6.48 1/2	8 1/2	4	3	28.5
9	77	Chadwell Heath . . .	»	6.56	7 1/2	5	74	47.4
20	14	Shenfield	»	7. 9	13	10	17	47.2
29	60	Chelmsford	»	7.18	9	9	46	63.8
38	46	Witham	»	7.27	9	8	66	58.8
51	53	Colchester	»	7.40	13	13	7	60.4
59	35	Manningtree	»	7.49	9	7	62	51.8
68	59	Ipswich	arr.	8. 0	11	9	24	50.7
			dep.	8. 4	...	...	...	...
80	50	Stowmarket	pass.	8.19	15	11	71	47.5
100	46	Tivetshall	»	8.39	20	19	76	59.5
114	77	Norwich	arr.	8.55	16	14	31	53.5

Average speed.

Norwich-Ipswich : 46 miles 18 chns. in 51 minutes = *54.4 m. p. h.*
Ipswich-London : 68 miles 59 chns. in 80 minutes = *51.6 m. p. h.*
Norwich-London (overall) : 114 miles 77 chns. in 135 minutes = *51.0 m. p. h.*

London-Ipswich : 68 miles 59 chns. in 80 minutes = *51.6 m. p. h.*
Ipswich-Norwich : 46 miles 18 chns. in 51 minutes = *54.4 m. p. h.*
London-Norwich (overall) : 114 miles 77 chns. in 135 minutes = *51.0 m. p. h.*

A photograph of the streamlined locomotives is given herewith, the leading dimensions being as shewn below :

Length over buffers . .	62′ 9″.
Weight in working order.	133 t. 3 c.
Boiler pressure	200 lb. per sq. in.
Diameter of driving wheels	6′ 8″.
Cylinder diameter . . .	17 1/2″.
Stroke	26″.
Tractive effort	25 380 lb.

Each train comprises six vehicles weighing 219 tons and giving accommodation for 54 first and 144 third-class passengers, the total length over buffers, including the engine, being 439' 9".

The carriages are of the open type and include two kitchen cars, the formation leaving Liverpool Street being :

	Seats.	*Weight.* T.	C.	Q.
Engine				
Brake third	36	32	5	0
Kitchen first	18	44	15	0
Open first	36	33	5	0
Open third	48	32	5	0
Kitchen third	24	44	5	0
Brake third	36	32	5	0
		219	0	0

Each vehicle is mounted on a standard 60' 0" steel underframe, and is 61' 6" long over body and 9' 3" wide over handles. The vehicles are fitted with Pullman vestibules and buckeye couplers and are carried on compound bolsters bogies. The body framing and panelling is of teak, the exterior being finished in varnish in accordance with the Company's standard practice.

The layout of the train is as shewn on the diagram. The whole of the seats are numbered and may be reserved and every effort has been made to ensure the maximum comfort for the individual passenger. As the journey time between Norwich and London is comparatively short, it is essential that meals should be served as rapidly as possible, and it will be seen from the plan that as no separate restaurant car accommodation is provided, the passenger can take meals at the seat which is allotted for the journey.

The scheme of interior decoration was designed for the Company by Mr. Murray Adams Acton of Messrs. Acton Surgey Ltd., 3 Bruton Street, London, W. The first class cars are lined with Rexine of a stone colour above the high waist line and with green Rexine below, the junction of the two colours being covered with strips of plain and gold coloured Alumilited Aluminium. The doors are covered with green Rexine outlined in red Rexine and decorated with ornemental features in Alumilited Aluminium.

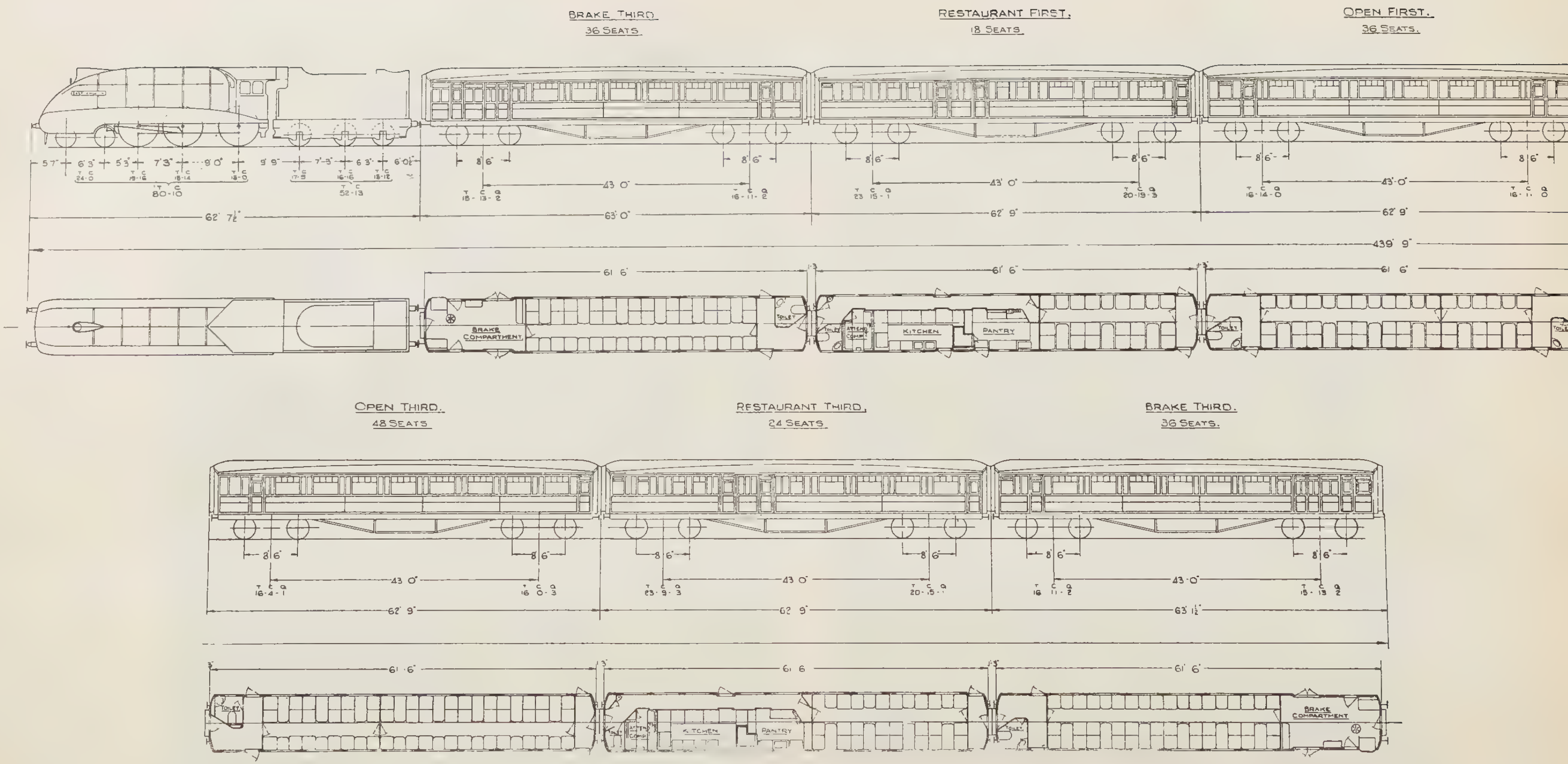
The seats are upholstered in a deep rose and gold moquette, the floor being covered with a mulberry coloured carpet over a 1/2" thick sponge rubber underlay. Curtains in silk brocade are provided at each window.

A roof light in an Alumilited Aluminium fitting is placed in the roof over each section, and net racks are provided along the cantrail.

The third-class saloons are also decorated in Rexine, the colours chosen being a light stone colour above the high waist line with Rexine having a shagreen finish below. The junction of the two colours is covered by strips of Alumilited Aluminium, whilst ornamental designs in this material are also placed on the doors. A green aisle carpet is provided between the seats and the remainder of the floor is covered with green cork lino. The seats are upholstered in fawn uncut moquette to tone with the general scheme of decoration.

In both first and third-class portions of the train, the seating is arranged with two passengers on one side of the gangway and one on the other, and to facilitate movement into and out of the double seats, the tables are provided with hinged flaps.

Steam heating is fitted throughout the



The « East Anglian Limited », London and North Eastern Railway.

Seats for 54 first class passengers and 144 third class passengers.

Total : 198 passengers.

train, and large sliding shutter ventilators are provided above each of the large side windows; torpedo ventilators are also fitted in the roof.

To make the service of meals to all seats in the train as convenient as possible, two kitchens have been provided, each equipped with electric cooking apparatus of the most modern type designed and supplied by Messrs. J. Stone & Co., and Messrs. Henry Wilson & Co., of Liverpool. The equipment in both kitchens is identical and consists of the main cooking range, comprising roasting and steaming ovens, two grills and a boiling table having four hot plates. A separate fish fryer is also provided and a vegetable boiler is arranged near the electrically heated sinks on the body side. An automatic water boiler including coffee and milk urn manufactured by Messrs. W. M. Still & Co. is arranged alongside the hot cupboard on the corridor partition, and an automatic refrigerator having separate compartments for iced wines, butter, cheese and general provisions is also fitted.

The necessary power is obtained from two 10-kw. axle-driven generators suspended under each kitchen car in accordance with L.N.E. standard practice and supplying power at 180-225 volts.

An Exide Ironclad battery of 210 ampere-hours is provided on each car for use when the train is standing. The usual pantry accommodation is also provided and in this connection it should be noted that the table linen, glass, crockery and silver are of distinctive design in keeping with the special character of the train. A particular feature is the wide corridors and ample circulating space at the ends of the carriages permitting easy movement of the passengers when joining and leaving the train.

The first-class lavatories are decorated in a blue Rexine fading out from dark at the bottom to pale blue at the ceiling. The wash basin and hopper are of white procelain, the interior fittings being chromium plated. The hot water apparatus is heated by means of steam in the winter time, whilst in summer heat is obtained from an electric immerser heater supplied from the train lighting dynamos.

The floor is covered with Korkoid to match the walls.

The third class lavatories are fitted in a similar manner, except that the prevailing tone is a biscuit colour, cream and brown Rexine, with the lower portion brown.

NEW BOOKS AND PUBLICATIONS.

[625. 14 (01]

Dr. Alexandre WASIUTYNSKI, Vice-Chairman of the Technical Council, Polish Ministry of Communications, Honorary Professor at the Warsaw Polytechnic School. — **Recherches expérimentales sur les déformations élastiques et le travail de la superstructure des chemins de fer** (*Experimental research on the elastic deformations and reactions of railway track*). — One volume (9 × 12 inches) of 136 pages, with 77 figures. — 1937, Académie des Sciences Techniques, Warsaw, Staszic Palace, 72, Nowy Swiat Street. — Librairie Dunod, 92, rue Bonaparte, Paris. (Price : 50 French francs.)

In the course of a long and brillant career as a Railway Engineer, Mr. Wasiutynski has endeavoured on various occasions to throw some light on the complicated problem of determining the elastic reactions of the permanent way under rolling loads.

As regards vertical static loads, the question has been the subject of exhaustive and somewhat theoretical studies by different authors.

The real difficulties of the problem arise when it is desired to take account of the dynamic factor in vertical loads, and these difficulties are accentuated when the action of horizontal, transverse and longitudinal forces and torsional stresses affecting the rails are entered upon.

Mr. Wasiutynski's first researches (1) date from 1897, when he published his paper on momentary deformations of the track, based on observations made on the Warsaw-Vienna line.

At the various Congresses of the International Railway Association, Mr. Wasiutynski was able to draw attention to the necessity for experimental research in order to determine with accuracy the conditions of stability and resistance of the track under the action of moving trains, and an important paper by him under the above title was recently published in the *Proceedings of the Warsaw Academy of Technical Sciences*.

(1) *Bulletin of the International Railway Congress*, December 1898, p. 1475 and October 1900, p. 3313 (English edition).

Convinced that the ascertainment of track resistance was mainly a practical problem, Mr. Wasiutynski and his Polish collaborators submitted a section of track to the action of new types of locomotives introduced by the Polish State for the hauling of heavy passenger trains at high speeds.

The selected experimental section of track is situated between Warsaw and Pruszkow and lies on the straight with a slightly falling gradient.

For the purpose of these experiments, Mr. Wasiutynski used the photographic method already employed by him in 1897, whereby errors due to the effects of play and inertia in recording instruments are excluded.

His paper gives full details of the means employed to arrive at a high degree of precision, such as the improvements made in the photographic method and the measures taken for the construction of an observation post on foundations sufficiently insulated from the earth vibrations set up by the passage of trains.

The reader will be aware that experimental study of the track involves either the direct measurement of rail stresses from changes in the length of the fibres, or else observation of the elastic curvature of the rail, in particular the depression of its supports, by which means the reaction of the track under the influence of the applied forces can be theoretically determined.

This calculation presupposes a knowledge of certain co-efficients, in particular the co-efficient of the sleeper seating,

the value of which must be accepted with caution and is discussed at some length in the paper.

The effect of moving loads on the rail supports, that is to say, the sleepers, ballast and formation, is also the subject of an exhaustive examination.

It will be recalled that the main conclusions of the paper appeared in the Note by Mr. Wasiutynski, appended to Mr. LEMAIRE's report on Question 1 of the Paris Congress, 1937, to which the reader is referred (1).

The paper also includes a very elaborate study of the stresses and elastic deformations of the track under vertical loads, and the results of the numerous experiments are shewn in tabular or graphical form.

The diagrams shew that the differences of deformation in the two hypotheses in which the rail is considered as a beam resting on isolated elastic supports or as beam resting on a continuous support, do not exceed 1/2 per cent, which corresponds to differences in rail stress of less than 5 %.

This finding is of the greatest importance, as it enables the calculations to be enormously simplified, and justifies the method recommended by the *American Special Committee on Stresses in Railroad Track*, also adopted by the Japanese Railways.

The experiments have shewn that there is no need to give too much weight to the speed factor, the effects of speed on the average depression of the rail being in general inconsiderable.

To limit the dynamic action of the wheels, concludes Mr. Wasiutynski, it is desirable :

(a) that the weight of the locomotive should be distributed over the wheels, taking into account the average overload of the main driving wheels and the trailing driving wheels;

(b) that the excess counterbalance weight should not be more than 10 %, and also be distributed over the driving wheels;

(c) that tyre flats should be limited not only with respect to depth but also with respect to length, which is the greater the more pronounced the flat.

These are the conclusions of a detailed examination of the method of construction of locomotives, a point to which the author attaches primary importance, as is evidenced by the following opinion expressed by him as far back as 1925 at the London Congress :

« A heavy overload on the permanent-way may be produced by inequilibrium of the moving masses of the locomotive mechanism and also by badly constructed or badly adjusted springs, »

The experiments on the Warsaw-Pruszkow line have shewn that account must be taken of an increase in the static pressure of the wheels of close on 30 % at speeds of 80 to 110 km. (50 to 68 miles)an hour and of about 20 % at speeds under 80 km. an hour so long as the excess counterbalance and tyre flats are not excessive.

A further result of the perfected photographic method employed by Mr. Wasiutynski was the bringing to light and explaining of some very curious phenomena, such as, for instance, the time lag in the vertical deformation of the rail in relation to the moment when the wheel passes over, and the production of axial longitudinal oscillations of the rail by variations in tractive effort.

Finally, a section is devoted to the reactions of the rail compared with its depression, shewing the great influence of the lateral and torsional forces.

In conclusion, the highly interesting results obtained by Mr. Wasiutynski demonstrate the importance of the experimental method in ascertaining the deformations and reactions of a permanent-way equipment.

Up to the present, this has been the only method by which certain points in

(1) *Bulletin of the Railway Congress Association*. October 1937.

this extremely complex question have been elucidated, the mathematical solution of which would have been, if not impossible, at any rate open to very grave doubts.

J. D.

[625. 113]

GERMAN STATE RAILWAYS. — **Abstecken und Vermarken von Gleisbogen nach dem Winkelbildverfahren** (Nalenz-Höfer Verfahren) (*Pegging of railway curves by the angles diagram method. — Nalenz-Höfer system*). — One volume (6 × 8 inches), of 188 pages with inset plates and numerous illustrations. — 1937; published by the Verkehrswissenschaftliche Lehrmittelgesellschaft m.b.H., Voss-Strasse, 6, Berlin, W.9. (Price : 2.20 Rm.)

The German State Railways have recently issued a manual dealing principally with the pegging of new lines and the adjustment and re-pegging of existing curves by means of what is known as the « angles diagram » method (Nalenz-Höfer system).

This subject was dealt with exhaustively by Dr.-Ing. Gerhard SCHRAMM, Reichsbahnrat, in an article which appeared in the February, 1935, issue (English edition) of the *Bulletin of the Railway Congress*.

Ordinarily, of course, curves are pegged out on the basis of different tangents, with the aid of trigonometrical tables. The disadvantage of this is the difficulty of obtaining accuracy when the curve is located in tunnels or deep cuttings or on high embankments.

In recent years methods have been devised whereby either an existing curve or a section of a many-sided polygon can be taken as a base line.

In France, the versines method has been employed for a long time, and an article by Mr. CHAPELLET on the subject of the systematic adjustment of curves by correcting the versines appeared in the November 1931 issue of the *Bulletin of the Railway Congress*.

In Germany the above-mentioned method of the « angles diagram » has been resorted to.

The manual supplied to the staff by the Reichsbahn is of an essentially practical nature, the angles diagram system being explained in the form of fully worked-out examples and the principle being dealt with mathematically in an appendix, followed by an examination of the degree of approximation of the method and the limits of its application.

The various problems involved in track alignment are also treated, with numerous and clearly-explained examples, and the rules are given for determining the requisite amount of superelevation, in particular the superelevation of the transitions, also the speed limitations for vehicles passing over curves.

It will be borne in mind that in Germany uncompensated centrifugal acceleration equal to a superelevation deficiency of 90 mm. (3 17/32 in.) is allowed.

A special chapter is devoted to S transitions (« doucines » : curves with points of contrary flexure) from circular curves to straight lines.

The reader will be aware that some Engineers are staunch supporters of the S curves for the transitions instead of linear variation, and that the question is highly controversial.

The Reichbahn favours the adoption of Dr. Schramm's S transition curve, composed of two parabolas of the 2nd degree, tangent to the middle point of the transition (1).

(1) Readers interested in the question are referred to the general study of transition curves published by Dr. SCHRAMM in the *Organ für die Fortschritte des Eisenbahnwesens*, No. 10, 15th May, 1937.

Being mainly intended for the use of the permanent-way staff, the manual recently issued by the Reichsbahn also forms an excellent guide for the training of railway technicians.

J. D.

[656. 256.2 (.73)]

ASSOCIATION OF AMERICAN RAILROADS (A. A. R.), SIGNAL SECTION. — **American Railway Signaling Principles and Practices.** — Chapter XXII : **Manual and controlled manual block systems, and fundamental theory of direct current.** — A pamphlet (8 × 6 inches) of 56 + 22 pages, illustrated. Published by the Signal Section of the A. A. R., 30, Vesey Street, New York, N. Y. — [Price : 35 cents (25 cents to members and railroad employees). Cost of the set of twenty-one chapters issued : 6.70 dollars (4.60 dollars to members and railroad employees.). Binder to accomodate 13 chapters : 1 dollar.]

There are three systems of block signalling employed in America : manual, interlocked and automatic. The latter was described in Chapter XV.

In the manual block system the signals are operated by hand, on information obtained from neighbouring signal boxes, but are not linked up with any special apparatus. Communication between the signal boxes is by telegraph or telephone, facilitated by the adoption of a special number communication code. The book gives an indication of the complete organisation, together with the majority of the regulations in force and the form of register in which the signalmen record all communications exchanged.

Under the interlocked system, known as the *controlled manual block*, corresponding with the *lock and block* in England, the signals are operated by hand but under the control of electrical and mechanical contrivances. In addition to the exchange of communications the signalmen have to operate a lever which releases at the other signal box the mechanism which controls the signal authorising the desired movement, and prevents a « line clear » indication being given for a train to proceed in the opposite direction.

Diagrams are included shewing in detail the electrical circuits between the signal boxes. Current also passes through continuous track circuits, so that signals cannot be pulled off unless the line is clear. The signal boxes may also contain mechanical or electrical interlocking frames for the operation of other signals.

The diagrams of circuits relate to single-line working. In the case of double-track operation the arrangements are similar, but in some cases train movements in the opposite direction are controlled by lock and block, whereas movements in the same directions are under automatic block.

The second part of the book gives the fundamental theory of direct current, and also deals briefly but effectively with magnetism, electro-magnetism and induction. The principles of single and multiple circuits in series and parallel are explained and applied to well-chosen practical examples. The authors have wisely kept to practical units, basing their definitions on the decisions comprised in the International system. The utility of this Chapter is enhanced by several tables : comparative resistance of various substances, conductor diameters and sections with permissible current, conversion table of various quantities expressed in mechanical, electrical and calorific units.

E. M.

OBITUARY.

Mr. Douglas VICKERS,

Director, London Midland and Scottish Railway,
Member of the Executive Committee of the Permanent Commission of the International Railway Congress Association.

We heard with the deepest regret of the death, on November 23rd, at the age of 76, of Mr. Douglas VICKERS, Director of the London Midland and Scottish Railway, and Member of the Executive Committee of the Permanent Commission of our Association.

He was the son of the late Colonel T. E. Vickers, Chairman of the firm of Vickers, Sons and Maxim, from 1873 to 1909, the name of which firm was changed to Vickers Limited, in 1911, and has long been famous for the manufacture of all kinds of armaments and steel construction materials. Mr. VICKERS was educated at Marlborough and was appointed a manager of the firm in 1889, and managing director in 1893. He succeeded his uncle, Mr. Albert Vickers as chairman in 1918 and retired in 1926, only retaining a directorship in the Company.

Mr. Douglas VICKERS took a deep interest in metallurgy; he made many valuable contributions to that science and was well known to the learned societies in Great Britain and elsewhere. He was a linguist of exceptional ability and travelled extensively. He founded the Douglas Vickers scholarship for employees of the works of Vickers Limited, and also a trust fund to be used for the benefit of elderly retired employees. In 1911, he provided funds to cover the cost of a trial of the tuberculin treatment for consumptives. From 1917 to 1926, he was treasurer of Sheffield University. He was also chairman of the Carlton Main Colliery Company and the Parkgate Iron and Steel Company, and a director of the Sabinas Company and the London Midland and Scottish Railway Company.

He became a Member of the Executive Committee of the Permanent Commission of the International Railway Congress Association in 1930, on the retirement of the late Mr. Gustav Behrens.

Mr. VICKERS took a deep interest in the work of our Association. He most regularly attended the meetings of the Permanent Commission and its Executive Committee, who much appreciated his exceptional business ability and genial disposition and on many occasions sought and welcomed his advice on various matters. He presided over the Meetings of the First Section (Way and Works) of the XIIth Session of the Association (Cairo, 1933) and also took an active part in the proceedings of the recent Paris Congress.

We wish to convey our sincerest sympathy to his family and the London Midland and Scottish Railway Company.

The Executive Committee.

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P. GHILAIN,

General Secretary of the Permanent Commission of the International Railway Congress Association.

(JULY 1937)

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1937 **385 .113 (.44)**

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1937 **621 .132.3 (.44)**

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1937 **656 .235.4 (.44)**

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1937 **385 .113 (.44)**

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1937 **625 .234**

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1937 **62. (01 & 624 .2**

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1937 **625 .5 (.494)**

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1937 **621 .114**

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1937 **662**

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1937 **621 .114**

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1937 **625 .14 (01**

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1937 **62. (01 & 621 .39**

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Les recherches de laboratoire sur la **soudure** et les applications de l'oxygène en métallurgie. (6 000 mots & fig.)

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1937 **621 .392 (.44) & 624 .3 (.44**

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CHEVENARD (P.) & WACHÉ (X.). — **Corrosion intercristalline des ferronickels chromés carburés**, écrouis après hypertrempe. (900 mots & fig.)

1937 — **691**

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1937 — **62. (01**

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JOUGLA (V.). — Comment les **rayons X** révèlent et contrôlent la structure de la matière. (6 000 mots & fig.)

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1937 — **621 .43**

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1937 — **621 .165**

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KEULEYAN (L.). — Carénage de **locomotives** françaises. (2 700 mots & fig.)

1937 — **621 .132.8 (.73)**

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Transformations d'anciennes voitures américaines en **automotrices à vapeur.** (2 300 mots et fig.)

1937 — **621 .135.4 & 625 .215**

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RACZ (E.). — Marche en courbe du matériel des chemins de fer. Détermination des efforts en résultant sur les **châssis et bogies.** (4 600 mots & fig.)

1937 — **621 .333**

Les Chemins de fer et les Tramways, avril, p. 87.

Système de réglage de **moteurs électriques** compound applicable à la traction électrique. (4 000 mots & fig.)

1937 — **621 .33 & 625 .255**

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Perfectionnements au **freinage rhéostatique** des équipements de traction à moteurs à courant continu. (6 300 mots & fig.)

1937 — **625 .234**

Les Chemins de fer et les Tramways, avril, p. 95.

Dispositif de **chauffage électrique** d'un train par des locomotives ou des automotrices associées en multiple traction. (2 000 mots & fig.)

1937 — **621 .132.8**

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Locomotives à adhérence supplémentaire sur rail central, pour lignes accidentées. (1 800 mots.)

1937 — **625 .144.2**

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Dispositif pour l'enregistrement continu du **dévers des voies ferrées.** (1 600 mots & fig.)

1937 — **621 .33 (.65)**

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L'**électrification** de la ligne Bône-Oued Kéberit. (3 000 mots & fig.)

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1937 — **625 .62 (.494)**

L'Industrie des voies ferrées et des transports automobiles, mars, p. 46.

VENTE. — Une ville fidèle au **tramway** : Zurich. (1 500 mots & fig.)

L'Ingénieur-Constructeur. (Paris.)

1937 — **625 .614**

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PASQUES (G.). — **Tramways et voies étroites.** Méthodes de calcul des appareils, des intersections et des raccordements. (2 900 mots & fig.)

1937 — **624 .2**

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SARTON (A.). — Utilisation d'un procédé graphique commode pour le calcul des **poutres continues.** (1 100 mots & fig.)

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1937 — **624 .51 (.73)**

L'Ossature métallique, avril, p. 165.

Le **Triborough Bridge** à New-York. (2 000 mots & fig.)

1937 — **621 .392 (.44) & 624 .32 (.44)**

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1937 **621 .392 & 624 .9**

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1937 **625 .144.1**

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FLAMENT (H.). — Les possibilités d'emploi des **très longues barres** dans l'armement des voies ferrées. (10 000 mots.)

1937 **621 .134.2**

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TOUVET. — Un nouvel exemple de distribution à **soupapes à phases indépendantes**. (9 000 mots & fig.)

1937 **625 .215**

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Nouveaux **bogies** pour wagons. (1 400 mots & fig.)

1937 **656 .257 (.44)**

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Notes sur des **cabines électriques** récemment édifiées à Paris-Nord, Nancy et Lagny. (8 000 mots & fig.)

1937 **656 .257 (.44)**

Revue Générale des chemins de fer, mai, p. 291.

LECOMTE. — Note sur le remplacement des deux **postes électriques** de Nancy par un poste électrique unique. (1 400 mots & fig.)

1937 **656 .257 (.44)**

Revue Générale des chemins de fer, mai, p. 295.

VINOT. — Le nouveau **poste électrique** de Lagny-Thorigny-Pomponne. (2 000 mots & fig.)

1937 **625 .251**

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REURE. — Essais de freinage par **freins à puissance autovariable** effectués par le réseau P.L.M. (4 000 mots & fig.)

1937 **625 .151**

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LÉVI (R.). — Les **appareils de voie** du raccordement de Darnetal. (1 000 mots & fig.)

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1937 **621 .132.3 (.43)**

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FUCHS (F.). — La nouvelle **locomotive** 2 C 2 pour trains rapides des Chemins de fer du Reich. (1 600 mots.)

1937 **625 .4 (.44)**

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1937 **385. (01 (.61 + .66)**

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ROUX-BERGER (P.). — Le **chemin de fer transsaharien** 1937. (2 300 mots & fig.)

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KOENIGS. — Der **Verkehr** als Grundlage der modernen Wirtschaft. (7 800 Wörter.)

1937 **656 .237.3 (.43)**

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WEIRAUCH. — Der **Prüfungsdienst** bei der Deutschen Reichsbahn. (12 700 Wörter.)

1937 **385 .1 (.436)**

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GRAILER (I.). — Die **Österreichischen Bundesbahnen** während der Weltwirtschaftskrise. (11 500 Wörter.)

1937 **385**
Archiv für Eisenbahnwesen, Heft 1, Januar-Februar, S. 153.
SIEDENTOP (I.). — Grundsätzliches über **Bahndichte und Bahnleistung.** (3 700 Wörter.)

1937 **385 .113 (.437)**
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Die **Eisenbahnen der tschechoslowakischen Republik** in den Jahren 1934 und 1935. (6 000 Wörter.)

1937 **385 .113 (.92)**
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Dr. OVERMANN. — Die **Eisenbahnen in Niederländisch Ostindien** in den Jahren 1934 und 1935. (3 200 Wörter.)

1937 **385. (.66) & 656. (.66)**
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PASCHEN (W.). — Die **Eisenbahnen** und andere Verkehrsmittel in Französisch-West-Afrika. (4 000 Wörter.)

Die Lokomotive. (Wien.)

1937 **621 .132.8 (.73)**
Die Lokomotive, April, S. 57.
1 C-C 2 **Heissdampfgelenklokomotive** der Seabord-Airlinie (U. S. A.) (1 400 Wörter & Abb.)

1937 **385 (.43)**
Die Lokomotive, April, S. 59.
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1937 **621 .132.5 (.47) & 621 .134.3 (.47)**
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2 G 2 **Heissdampf-Güterzuglokomotive** der Russischen Bahnen. (4 500 Wörter.)

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1937 **625 .164 (.43)**
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BURGER. — Die Lehren einer **Schneeverwehung.** (2 400 Wörter & Abb.)

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MEYER (R.). — Vom **Reichsbahn-Werbeplakat** und seinem Aushang. (1 500 Wörter & Abb.)

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SCHMIDT. — Hundert Jahre Leipzig-Dresdner Eisenbahn. (7 500 Wörter & Abb.)

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BEHNES. — Das neue **Empfangsgebäude** Düsseldorf Hbf. (2 200 Wörter & Abb.)

Elektrische Bahnen. (Berlin.)

1937 **625 .4 (.43)**
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SCHIEB. — Die Berliner Nordsüd-S- Bahn und ihre **Stromversorgung.** (4 000 Wörter & Abb.)

1937 **621 .331 (.43)**
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LANG (W.). — Die **Stromversorgung** der Berliner Verkehrs-Aktiengesellschaft. (2 500 Wörter & Abb.)

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HÖFER. — **Geräte zur Pfeilhöhenmessung.** (1 200 Wörter & Abb.)

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1937 621 .132.8 & 621 .43
Zeitschr. des Ver. deutsch. Ing., Nr. 20, 15. Mai, S. 575.
Diesellokomotive mit unmittelbarem Antrieb. (600 Wörter & Abb.)

Zeitschrift für das gesamte Eisenbahn-Sicherungswesen. (Berlin.)

1937 621 .33 & 656 .25
Zeitschr. für das ges. Eisenb.-Sicherungsw., Nr. 6, 1. Mai S. 69.
BUCKEL (R.). — Untersuchung über die Beeinflussung von **Sicherungsanlagen** auf Wechselstrombahnen. (3 300 Wörter & Abb.)

1937 656 .257
Zeitschr. für das ges. Eisenb.-Sicherungsw., Nr. 6, 1. Mai, S. 76.
BECKH (H.). — **Kraftstellwerke** der Vereinigten Eisenbahn-Signalwerke (Bauart Siemens & Halske 1912) in Bayern. (1 500 Wörter & Abb.)

Zeitung des Vereins mitteleuropäischer Eisenbahnverwaltungen. (Berlin.)

1937 656 .225 (.485) & 656 .261 (.485)
Zeitung des Ver. mitteleurop. Eisenbahnverw., Nr. 12, 25. März, S. 209.
LILLIENDAHL (A.). — **Isolierte Kleinbehälter** bei den Schwedischen Staatsbahnen. (3 200 Wörter & Abb.)

1937 656
Zeitung des Ver. mitteleurop. Eisenbahnverw., Nr. 12, 25. März, S. 219.
Zur Frage Eisenbahn-Kraftwagen. (2 300 Wörter.)

1937 388 (.73) & 656 .222.5 (.73)
Zeitung des Ver. mitteleurop. Eisenbahnverw., Nr. 13, 1. April, S. 227; Nr. 14, 8. April, S. 243.
GRETSCH (R.). — Zur Frage des **New Yorker nahverkehrs.** (11 900 Wörter & Abb.)

1937 385. (09 (.43)
Zeitung des Ver. mitteleurop. Eisenbahnverw., Nr. 15, 15. April, S. 263.
KRECK (K.). — 40 Jahre Reichsbahndirektion Mainz. (8 700 Wörter.)

1937 656 .235 (.43)

Zeitung des Ver. mitteleurop. Eisenbahnverw., Nr. 16, 22. April, S. 283.

PASZKOWSKI. — Von privatwirtschaftlicher Preisgestaltung zum gemeinwirtschaftlichen **Gütertarif.** (8 000 Wörter.)

1937 656 .235.6

Zeitung des Ver. mitteleurop. Eisenbahnverw., Nr. 17, 29. April, S. 303.

AHLBERG. — Frachtverteilung im internationalen **Güterverkehr.** (3 800 Wörter & Abb.)

1937 385. (09 (.43)

Zeitung des Ver. mitteleurop. Eisenbahnverw., Nr. 17, 29. April, S. 308.

Hundert Jahre Leipzig-Dresdner Eisenbahn. (6 000 Wörter.)

1937 656 .23 (.43)

Zeitung des Ver. mitteleurop. Eisenbahnverw., Nr. 18, 6. Mai, S. 319.

TREIBE (P.). — **Wandlungen in der Struktur** des Reichsbahnverkehrs. (5 000 Wörter & 4 Tafeln.)

1937 385

Zeitung des Ver. mitteleurop. Eisenbahnverw., Nr. 19, 13. Mai, S. 335.

KLEINMANN (W.). — Die Eisenbahnen als **Brücke** zwischen den Völkern. (4 000 Wörter.)

In English.

Electrical Industries. (London.)

1937 656 & 621 .39

Electrical Industries, No. 1880, April 21, p. 519.

HARLEY CARTER. — **Pyrometers.** (1 600 words & fig.)

1937 621 .33

Electrical Industries, No. 1880, April 21, p. 527.

KAAN (E. R.). — **Modern traction** practice abroad. Extract from a report to the XIIIth International Railway Congress. (2 000 words & fig.)

1937 621 .33

Electrical Industries, No. 1881, April 28, p. 558.

Mercury vapour rectifiers. An abstract of a report by Messrs. Eggenberger and Eckert, Chief electrical engineers, Swiss Federal Railways, presented to the XIIIth International Railway Congress in Paris. (1 300 words.)

Engineer. (London.)

1937 621 .4

Engineer, No. 4240, April 16, p. 443.

KENSIT (H. E. R.). — The growth of the **internal combustion engine.** (1 500 words & fig.)

1937 621 .392

Engineer, No. 4240, April 16, p. 455.

Resistance welding control. (1 700 words & fig.)

1937 621 .132.3 (.42)

Engineer, No. 4240, April 16, p. 457.

New London & North Eastern Railway locomotives. (800 words & fig.)

1937 621 .43

Engineer, No. 4240, April 16, p. 458.

BURN (W. S.). — **Development of the two-stroke cycle oil engine.** (6 500 words & fig.)

1937 621 .43

Engineer, No. 4241, April 23, p. 466.

RICARDO (H. R.). — Present position and prospects of the **high speed heavy oil engine.** (4 400 words.)

1937 62. (01 (06

Engineer, No. 4241, April 23, p. 485.

Paper presented at the London Congress of the International Association for testing materials by TAPSELL (H. J.). — The phenomenon of **creep recovery.** (1 300 words.)

1937 62. (01 (06

Engineer, No. 4241, April 23, p. 485.

Paper presented at the London Congress of the International Association for testing materials by CLARK (C. L.) & WHITE (O. E.). — The mechanism of **the creep of metals.** (1 000 words.)

1937 62. (01 (06

Engineer, No. 4241, April 23, p. 486.

Paper presented at the London Congress of the International Association for testing materials by MAC QUIGG (C. E.). — **Effect of temperature on the properties of steels.** (1 200 words.)

1937 62. (01 (06

Engineer, No. 4242, April 30, p. 519.

Paper presented at the London Congress of the International Association for testing materials by EVANS (U. R.). — **Corrosion** as influenced by increased temperature (1 300 words.)

1937 62. (01 (06

Engineer, No. 4242, April 30, p. 520.

Paper presented at the London Congress of the International Association for testing materials by JENKINS (H. M.). — **The chemical properties and stability of metals at high temperatures.** (1 300 words.)

1937 62. (01 (06

Engineer, No. 4242, April 30, p. 520.

Paper presented at the London Congress of the International Association for testing materials by GOUGH (H. J.). — Characteristics of the **deformation and fracture of metals** as revealed by X-rays. (1 400 words.)

1937 669 .1 (06

Engineer, No. 4243, May 7, p. 535; No. 4244, May 14, p. 558

Iron and Steel Institute. (12 000 words.)

1937 621 .131.3 (.42)
Engineer, No. 4243, May 7, p. 547.
L. M. S. Railway **Dynamometer car** trials. (3 200 words.)

1937 624 .1
Engineer, No. 4244, May 14, p. 556.
Sinking deep caissons by the sand-island method. (4 600 words & fig.)

1937 621 .8 & 621 .9
Engineer, No. 4244, May 14, p. 564.
SCHLESINGER (G.). — **Machine tool** electric drives. (1 500 words, 10 tables & fig.)

1937 621 .132.3 (.44)
Engineer, No. 4244, May 14, p. 580.
A French **streamlined Pacific engine.** (200 words & fig.)

1937 62. (01 & 669
The Metallurgist, p. 18, Supplt. to the Engineer, April 30.
Theories of **age-hardening.** (2 500 words.)

1937 669 .1
The Metallurgist, p. 23, Supplt. to the Engineer, April 30.
The alloys of **iron, vanadium** and **carbon.** (1 800 words & fig.)

1937 669 .1
The Metallurgist, p. 25, Supplt. to the Engineer, April 30.
MILEY (H. A.). — **Iron** oxide films. (5 000 words.)
(To be continued.)

Engineering. (London.)

1937 621 .132.3 (.42)
Engineering, No. 3718, April 16, p. 443.
2-6-0 type **locomotive** for the London & North Eastern Railway. (700 words & fig.)

1937 62. (01 (06
Engineering, No. 3719, April 23, p. 460.
International Association for **testing materials** congress. (5 000 words.)

1937 621 .31 (.42) & 621 .43 (.42)
Enpineering, No. 3719, April 23, p. 462.
Emergency generating set at Paddington station, Great Western Railway. (1 700 words & fig.)

1937 624 .2
Engineering, No. 3719, April 23, p. 469.
HOPKINS (H. J.). — The solution of **continuous girders** by the relaxation method. (2 000 words & fig.)

1937 62. (01 & 621 .43
Engineering, No. 3719, April 23, p. 475.
WILLIAMS (C. G.). — Factors influencing wear of valve seats in **internal-combustion engines.** (3 500 words & fig.)

1937 621 .334
Engineering, No. 3719, April 23, p. 477.
Electric goods-handling trucks. (1 000 words & fig.)

1937 621. (06 (∞)
Engineering, No. 3719, April 23, p. 478.
The **third world power conference.** (6 600 words.)

1937 62. (01
Engineering, No. 3720, April 30, p. 490.
The Smith **wear** and **lubricant testing machine.** (1 000 words & fig.)

1937 62. (01 & 669 .1
Engineerieng, No. 3720, April 30, p. 495.
High-tensile structural **steels.** (3 000 words.)

1937 656 .212.6 (.42)
Engineering, No. 3720, April 30, p. 506.
20-ton wagon tippler. (2 200 words & fig.)

1937 621 .131.3
Engineering, No. 3721, May 7, p. 519.
Dynamometer-car trials on the London Midland & Scottish Railway. (1 300 words.)

1937 625 .172 (.42)
Engineering, No. 3721, May 7, p. 530.
Weed-killing train on the Great Western Railway. (1 600 words & fig.)

1937 624 .62 (.73)
Engineering, No. 3722, May 14, p. 541.
The Lorrain-road **viaduct** over Rocky river valley, Cleveland, Ohio. (4 000 words & fig.)

1937 62. (01 (06
Engineering, No. 3722, May 14, p. 543.
International Association for **testing materials** congress. (6 600 words.) *(To be continued.)*

1937 62. (01 & 669 .1
Engineering, No. 3722, May 14, p. 557.
The flow of **metals.** (1 700 words.)

1937 669 .1 (06
Engineering, No. 3722, May 14, p. 559.
The **Iron** and **Steel** Institute. (6 000 words.)

1937 656 .212.6 (.73)
Engineering, No. 3722, May 14, p. 566.
Centrifugal **bulk-loading machine.** (600 words.)

Engineering News-Record. (New York.)

1937 625 .1 (06 (.73)
Engineering News Record, No. 13, April 1, p. 486.
More research planned at A. R. E. A. meeting. Expansion of research in the field of railway maintenance and construction planned for at the 38th annual meeting. Progress on current research reported. Problems connected with **high-speed trains** considered. (3 400 words & fig.)

1937 **625 .1 (.73)**
Engineering News Record, No. 16, April 22, p. 577.
MERCER (G. L.). — **New rail link** to Gulf completed. (2 600 words & fig.)

1937 **624 .8 (.73)**
Engineering News Record, No. 16, April 22, p. 583.
A record size bascule. (5 700 words & fig.)

Modern Transport. (London.)

1937 **656 .1 (.42)**
Modern Transport, No. 944, April 17, p. 3.
ELLIOTT (H.). — Small consignments by road. (1 900 words & fig.)

1937 **656. (06 (.68)**
Modern Transport, No. 944, April 17, p. 5.
South African transport conference. **Train and truck control-acceleration.** Railcar design — All-steel coaches — Gauge and track — Articulated locomotives. (3 000 words.)

1937 **621 .132.3 (.42)**
Modern Transport, No. 944, April 17, p. 7.
New 2-6-0 type **locomotive** for L.N.E.R. (800 words & fig.)

1937 **621 .33**
Modern Transport, No. 944, April 17, p. 9.
FAIRBURN (C. E.). — Railway **electrification.** Introduction of improved apparatus. (1 700 words.)

1937 **656 .253 (.42)**
Modern Transport, No. 945, April 24, p. 3.
Resignalling of Leeds new station. Colour ligths and relay interlocking. (1 600 words & fig.)

1937 **621 .33 (.68)**
Modern Transport, No. 945, April 24, p. 5.
WATERMEYER (T. H.). — Railway **electrification** in South Africa. (4 000 words & fig.)

1937 **656 .25**
Modern Transport, No. 945, April 24, p. 9.
Power signalling. Automatic standby plant. (900 words & fig.)

1937 **621 .33 (.44)**
Modern Transport, No. 946, Mai 1, p. 3.
Railway **electrification** in France. Paris-Le Mans equipment. (1 400 words & fig.)

1937 **621 .392 & 625 .14**
Modern Transport, No. 946, Mai 1, p. 4.
ELLSON (G.). — Welding of **steel rails.** (2 000 words.)

1937 **625 .175 (.66) & 625 .232 (.66)**
Modern Transport, No. 946, Mai 1, p. 5.
Inspection cars for Gold Coast Railway. Self-contained units for extended journeys. (1 400 words & fig.)

1937 **625 .13 (.42) & 625 .17 (.42)**
Modern Transport, No. 946, Mai 1, p. 6.
The Mersey **tunnel.** Cleansing problems.

1937 **621 .131.3 (.42)**
Modern Transport, No. 946, Mai 1, p. 8.
Dynamometer-car trials on L. M. S. R. St. Pancras to Leeds and Manchester. (1 400 words & fig.)

1937 **625 .23 (0 (.436)**
Modern Transport, No. 947, May 8, p. 3.
KARNER (E). — **All-metal coaches** in Austria. Experiences on the Federal Railways. (1 400 words & fig.)

1937 **656 .222 (.44)**
Modern Transport, No. 947, May 8, p. 5.
French **suburban train** working. No. 1. — « Packet » operation from Bastille. (1 500 words & fig.)

1937 **656 (.42)**
Modern Transport, No. 947, May 8, p. 7.
GARDINER (R.) **Transport progress** in Scotland. Some features of the L. N. E. R. (2 300 words & fig.)

1937 **656 .253 (.42)**
Modern Transport, No. 948, May 15, p. 3
Relay-controlled signalling in Liverpool. (2 400 words & fig.)

1937 **621 .43 (.42)**
Modern Transport, No. 948, May 15 p. 5.
Diesel-engined industrial locomotive. (1 100 words & fig.)

1937 **625 .232 (.42)**
Modern Transport, No. 948, May 15, p. 6.
Composition of the **L. M. S. Royal train.** (2 000 words & fig.)

Railway Age. (New York.)

1937 **621 .132.8 (.73) & 621 .335 (.73)**
Railway Age, No. 12, March 20, p. 468.
Steamotive unit, for turbo-electric U. P. locomotive. (3 200 words & fig.)

1937 **625 .1 (06 (.73)**
Railway Age, No. 12. March 20, p. 478.
Engineering officers meet at Chicago (abridged account of proceedings of thirty-eighth annual convention of A. R. E. A. (36 000 words & fig.)

1937 **656 .25 (06 (.73)**
Railway Age. No. 12, March 20. p. 505.
Signal section of the A. A. R. convenes in Chicago (abridged account of proceedings at the 43th annual convention). (Reports on **economics effected by signaling,** new aspects and rules for higher speeds, descriptions of modern equipment, etc.) (8 600 words.)

1937 **621 .135 (01, 625 .14 (01 & 625 .22**
Railway Age, No. 14, April 3, p. 589.
TALBOT (A. N.). — The relation between **track and rolling stock.** (5 000 words & fig.)

1937 **621 .139 (.73), 625 .18 (.73) & 625 .27 (.73)**
Railway Age, No. 14, April 3, p. 594.
Supply work highly organized on Santa Fe. (2 800 words & fig.)

1937 **625 .244 (.73)**
Railway Age, No. 14, April 3. p. 599.
Automatic heating system for refrigerator cars. (1 200 words & fig.)

1937 **385 .3 (093 (.73)**
Railway Age, No. 14, April 3, p. 601.
I. C. C. celebrates its jubilee (50 years existence). (2 800 words.)

1937 **621 .135 (.73) & 625 .21 (.73)**
Railway Age, No. 14, April 3, p. 603.
SHEEHAN (W. M.). — **Steel castings** for high-speed railroad service. (4 000 words.)

1937 **625 .111 (.73)**
Railway Age, No. 15. April 10, p. 626.
Southern Pacific improves Tehachapi line. (2 200 words & fig.)

1937 **625 .245 (.73)**
Railway Age, No. 15, April 10, p. 629.
Seaboard 70-ton hopper cars for handling phosphate. (1 200 words & fig.)

1937 **625 .23 (.73)**
Railway Age, No. 15. April 10. p. 639.
New **streamliners** to have several innovations. (1 000 words & fig.)

1937 **625 .111 (.73)**
Railway Age, No. 16. April 17. p. 668.
Santa Fe completes Denver-Texas cut-off. (3 700 words & fig.)

1937 **625 .14 (01, 656 .222.1 & 656 .25**
Railway Age, No. 16. April 17. p. 673.
SILLCOX (L. K.). — **Time rules transport.** (4 400 words & fig.)

1937 **656 .1 & 656 .232**
Railway Age. No. 16. April 17, p. 677.
WHITE (A. F.). — Costs to **control competition.** (3 200 words.)

1937 **656 .257 (.73)**
Railway Age. No. 16. April 17. p. 683.
Remote control on Pennsylvania. (1 100 words & fig.)

1937 **656 .212.6 (.73) & 656 .213 (.73)**
Railway Age. No. 17. April 24. p. 704.
Coal dumpers built by N. & W. embody latest improvements. (3 800 words & fig.)

1937 **385. (072 (.73)**
Railway Age. No. 17. April 24. p. 709.
Timken's research and test laboratory in new quarters. (1 500 words & fig.)

1937 **625 .162 (.73) & 656 .259 (.73)**
Railway Age. No. 17. April 24, p. 719.
Illumination for grade crossings. (1 200 words & fig.)

1937 **656 .261 (.73)**
Railway Age, No. 17, April 24, p. 721.
Central Vermont features modern transportation. (2 200 words & fig.)

1937 **656 (.42)**
Railway Age, No. 17, April 24, p. 726.
Rail-Highway **co-ordination** succeeds in England. (1 800 words & fig.)

Railway Engineering and Maintenance. (Chicago.)

1937 **625 .143.4 (.73) & 665 .882 (.73)**
Railway Engineering and Maintenance, April, p. 265.
Butt-welds **rails** in 4 000 ft. lengths for two tunnels. (4 400 words & fig.)

1937 **625 .142.2 (.73) & 625 .144.4 (.73)**
Railway Engineering and Maintenance, April, p. 268.
Chesapeake & Ohio preframes and bores all **treated timber.** (4 300 words & fig.)

1937 **614 .8 (.73)**
Railway Engineering and Maintenance, April, p. 273.
PARIS (C. H.). — Measuring the human element in **accident prevention.** (4 900 words & fig.)

1937 **625 .14 (093 (.73)**
Railway Engineering and Maintenance, April, p. 277.
NEWTON (A. W.). — **Laying track** in 1869. (5 300 words & fig.)

1937 **625 .111 (.73)**
Railway Engineering and Maintenance, May, p. 335.
Santa Fe perfects **curve-throwing technic.** (4 900 words & fig.)

1937 **625 .17 (.73) & 656 .284 (.73)**
Railway Engineering and Maintenance, May, p. 338.
O'ROURKE (G. M.). — « Through **hell and high water** ». (6 300 words & fig.)

1937 **625 .154 (.73)**
Railway Engineering and Maintenance, May, p. 345.
CRAMER (F. H.). — Mc Cready (W.). — What one railroad has learned about **turntables.** (4 800 words & fig.)

1937 **656 .259 (.73)**
Railway Engineering and Maintenance, May, p. 348.
Builds **slide detector** fence of unusual design. (1 400 words & fig.)

1937 **625 .143 (.73)**
Railway Engineering and Maintenance, May, p. 349.
Rail production in 1936 at five-year high. (700 words.)

Railway Gazette. (London.)

1937 621 .132.1 (.42)
Railway Gazette, No. 16, April 16, p. 744.
British locomotives types — IX. London & North Eastern Railway. (Figures.)

1937 621 .132.6 (.43)
Railway Gazette, No. 16, April 16, p. 747.
Lübeck-Büchen Railway **double articulated trains.** (1 000 words.)

1937 625 .231 (.42)
Railway Gazette, No. 16, April 16, p. 748.
New **rolling stock** for C. L. C. Liverpool-Manchester service. (1 400 words.)

1937 385 .4 (.42) & 621 .138 (.42)
Railway Gazette, No. 16, April 16, p. 749.
Reorganisation of the **motive power** department of the London Midland & Scottish Railway. — I. (3 800 words & fig.)

1937 625 .232 (.54)
Railway Gazette, No. 16, April 16, p. 754.
New **saloon coach** for H. H. de Maharaja of Indore. (3 400 words & fig.)

1937 621 .132.3 (.42)
Railway Gazette, No. 16, April 16, p. 758.
New **2-6-0 type locomotives,** London & North Eastern Railway. (700 words & fig.)

1937 621 .132.1 (.42)
Railway Gazette, No. 17, April 23, p. 800.
British locomotive types X. London & North Eastern Railway. (Figures.)

1937 385 .4 (.42) & 621 .138 (.42)
Railway Gazette, No. 17, April 23, p. 803.
Reorganisation of the **motive power** department of the London Midland & Scottish Railway. — II. (2 100 words & fig.)

1937 656 .253 (.42)
Railway Gazette, No. 17, April 23, p. 813.
Resignalling of Leeds new station. (2 400 words & fig.)

1937 621 .132.3 (.42)
Railway Gazette, No. 17, April 23, p. 817.
New **0-6-0 locomotives,** Great Northern Railway. (600 words & fig.)

1937 621 .132.1 (.42)
Railway Gazette, No. 18, April 30, p. 845.
British locomotive types — XI. London & North Eastern Railway. (Figures.)

1937 385. (093)
Railway Gazette, No. 18, April 30, p. 847; No. 20, May 14, p. 936.
LEE (Ch. E.). — The **evolution of railways.** (8 200 words & fig.)

1937 385 .4 (.42) & 621 .138 (.42)
Railway Gazette, No. 20, May 14, p. 851.
Reorganisation of the **motive power** department of the London Midland & Scottish Railway III. (4 000 words & fig.)

1937 621 .9 & 665 .882
Railway Gazette, No. 20, May 14, p. 861.
A new **oxygen cutting machine.** (600 words & fig.)

1937 656 .222.1 (∞)
Railway Gazette, No. 18, April 30, p. 865.
ALLEN (C. J.). — **Railway speed** developments in 1936. (2 700 words, 8 tables & fig.)

1937 621 .13 (0 & 621 .131
Railway Gazette, No. 19, May 7, p. 894.
DIAMOND (E. L.). — **Rejuvenating old locomotives.** (2 200 words & fig.)

1937 621 .132.1 (.42)
Railway Gazette, No. 20, May 14, p. 935.
British locomotive types — XII Southern Railway. (Figures.)

1937 621 .132.3 (.44)
Railway Gazette, No. 20, May 14, p. 939.
Locomotive development in France. (1 200 words & fig.)

1937 625 .143.1 (.42)
Railway Gazette, No. 20, May 14, p. 941.
Flat-bottom track on London Midland & Scottish Railway main lines. (500 words & fig.)

1937 621 .86 (.42)
Railway Gazette, No. 20, May 14, p. 944.
A simple and effective lifting device. (1 000 words & fig.)

1937 625 .245 (.42)
Railway Gazette, No. 20, May 14, p. 945.
Great Western Railway **vehicles for exceptional loads.** V. (Figures.)

1937 621 .43 (.82)
Diesel Ry. Traction, p. 774, Supplt. to the Ry. Gazette, April 16.
Features of the hundred **railcars** for Argentina. (3 100 words & fig.)

1937 621 .253 (.73)
Diesel Ry. Traction, p. 778, Suppl. to the Ry. Gazette, April 16.
More 3 600 B. H. P. **oil-electric locomotives** (1 200 words.)

1937 621 .43 (.941)
Diesel Ry. Traction, p. 779, Supplt. to the Ry. Gazette, April 16.
Diesel-electric railcars for Australia. (2 300 words & fig.)

1937 **621 .43 (.42)**
Diesel Ry. Traction, p. 782, Supplt. to the Ry. Gazette, April 16.
Hydraulic remote control for railcar applications. (1 400 words & fig.)

1937 **621 .43 (.56)**
Diesel Ry. Traction, p. 784, Supplt. to the Ry. Gazette, April 16.
Railcar operation in Syria. (2 600 words & fig.)

1937 **621 .43 (.54)**
Diesel Ry. Traction, p. 962, Supplt. to the Ry. Gazette, May 14.
Successful **railcar operation** on the Great Indian Peninsula Railway. (700 words & fig.)

1937 **621 .43 (.931)**
Diesel Ry. Traction, p. 963, Supplt. to the Ry. Gazette, May 14.
Modern **railcar development** in New Zealand. (1 200 words & fig.)

1937 **621 .43 (.51)**
Diesel Ry. Traction, p. 965, Supplt. to the Ry. Gazette, May 14.
A **rebuilt railcar,** Kowloon-Canton Railway. (500 words & fig.)

1937 **621 .43 (.44)**
Diesel Ry. Traction, p. 966, Supplt. to the Ry. Gazette, May 14.
4 000 **B. H. P. locomotives** for the P. L. M. Railway. (2 000 words & fig.)

1937 **621 .43 (.81 & 656 .29 (.81)**
Diesel Ry. Traction, p. 968, Supplt. to the Ry. Gazette, May 14.
A **railcar shipment problem.** (1 000 words & fig.)

1937 **621 .43 (.73)**
Diesel Ry. Traction, p. 970, Supplt. to the Ry. Gazette, May 14.
The Winton two-stroke Railway **oil engines** (2 200 words & fig.)

1937 **621 .43 (.43)**
Diesel Ry. Traction, p. 974, Supplt. to the Ry. Gazette, May 14.
Railcars for local traffic in Germany. (800 words & fig.)

1937 **621 .335 (.44)**
Electric Ry. Traction, p. 878, Supplt. to the Ry. Gazette, April 30.
Development of **metadyne control** in France. (1 000 words & fig.)

1937 **621 .33 (.494) & 625 .3 (.494)**
Electric Ry. Traction, p. 880, Supplt. to the Ry. Gazette, April 30.
A notable **mountain railway** conversion. (1 000 words & fig.)

1937 **621 .33 (.46)**
Electric Ry. Traction, p. 883, Supplt. to the Ry. Gazette, April 30.
Spanish **railway electrification.** (1 400 words & fig.)

Railway Magazine. (London.)

1937 **385. (09 (.73)**
Railway Magazine, May, p. 315.
ROLAND (E.). — **Railway practice** in the U. S. A. (3 500 words.) *(To be continued.)*

1937 **625 .17 (.41)**
Railway Magazine, May, p. 320.
Permanent way in the Free State. (1 000 words & fig.)

1937 **656 .222.1 (.42)**
Railway Magazine, May, p. 322.
ALLEN (C. J.). — **British locomotive practice** and performance. (5 000 words & fig.)

1937 **621 .132 (.41) & 625 .232 (.41)**
Railway Magazine, May, p. 335.
New **rolling stock,** G. S. R. (800 words & fig.)

1937 **621 .132.1 (.42)**
Railway Magazine, May, p. 341.
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P. GHILAIN,

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(AUGUST 1937)

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1937 **621 .43 & 621 .89**

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Huiles de graissage pour moteurs à explosion d'omnibus automobiles et d'automotrices légères : **Purification des huiles altérées** et leur réemploi.

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1937 **691**

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1937 **625 .62**

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Augmentation de la vitesse commerciale des tramways par la **transformation des moteurs** et de leur transmission.

Bruxelles, Secrétariat de l'U. I. T. C. T. P. A., 18, avenue de la Toison d'Or. 1 brochure, 23 pages et figures.

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Le développement des **chemins de fer en Chine.** (1 20 mots.)

1937 385 .113 (.44)
Chronique des transports, n° 11, 10 juin, p. 2.
La Compagnie des **Chemins de fer de l'Est** en 1936 (5 500 mots.)

Electricité. (Paris.)

1937 621 .392
Electricité, avril, p. 161.
La technique de la **soudure** par résistance des métaux ferreux et non-ferreux en feuilles. (2 400 mots.)

1937 625 .234
Electricité, mai, p. 190.
PLA. — Le **conditionnement de l'air** dans les voitures de chemins de fer. (3 600 mots & fig.)

Génie civil. (Paris.)

1937 33
Génie civil, n° 2858, 22 mai, p. 461.
RAZOUS (P.). — **Rapports économétriques** entre la production, la main-d'œuvre, le niveau des prix, les salaires et le pouvoir d'achat. (4 500 mots & fig.)

1937 **691**
énie civil, nº 2859, 29 mai, p. 487.
PROT (M.) & GOLDOWSKI (N.). — Recherches sur **corrosion** des alliages de magnésium par l'essence thylée. (1 700 mots & fig.)

1937 **62. (01**
énie civil, nº 2860, 5 juin, p. 501; nº 2861, 12 juin, p. 522.
de FLEURY (R.) & PORTIER (H.). — Les relations ntre l'allègement et la sécurité dans les **transpositions e matériaux.** (5 600 mots & fig.)

L'Allègement dans les transports. (Lucerne.)

1937 **625 .4 (.44)**
'Allègement dans les transports, mai-juin, p. 54.
SIMONETTA (J.). — **Téléphérique** d'Auron. (1 300 ots & fig.)

1937 **625 .4 (.45)**
'Allègement dans les transports, mai-juin, p. 67.
HUG. — Le **téléphérique** San-Remo - Monte Bignone. 800 mots & fig.)

La Technique moderne. (Paris.)

1937 **621 .9**
a Technique moderne, nº 10, 15 mai, p. 329.
Les **machines-outils** pour travail des métaux en 1937. 8 300 mots & fig.)

Le Container. (Paris.)

1937 **656 .225 & 686 .261**
e Container, mars, p. 3.
Conditions techniques à remplir par les **containers** our leur utilisation en trafic international. (15 000 mots fig.)

Les Chemins de fer et les Tramways. (Paris.)

1937 **385. (06 .4 (.44)**
Les Chemins de fer et les Tramways, mai, p. 111.
Le palais des **chemins de fer** à l'Exposition internationale de Paris, 1937. (4 700 mots & fig.)

1937 **621 .43**
Les Chemins de fer et les Tramways, mai, p. 118.
Nouveaux **moteurs pour la traction.** (1 800 mots & fig.)

1937 **621 .132.8 & 621 .43**
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Procédé de démarrage pour **locomotives Diesel** avec commande directe. (2 000 mots & fig.)

1937 **621 .33**
Les Chemins de fer et les Tramways, mai, p. 123.
VIÉ (G.). — A propos de **l'électrification** des chemins de fer. (1 800 mots.)

1937 **656 .253**
Les Chemins de fer et les Tramways, mai, p. 125.
La **signalisation** lumineuse électrique. (1 300 mots & fig.)

1937 **385. (06.4 (.44)**
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Exposition internationale de Paris, 1937. Le Palais des **chemins de fer.** (5 000 mots & fig.)

1937 **621 .4 (.44)**
Les Chemins de fer et les Tramways, juin, p. 141.
Train de **combustibles et carburants** forestiers. Leur exposition à la Gare St-Lazare, le 2 juin 1937. (1 300 mots & fig.)

1937 **621 .132.8 (.44) & 621 .43 (.44)**
Les Chemins de fer et les Tramways, juin, p. 143.
Locomotive de 4 000 C. V. du P. L. M. (1 500 mots & fig.)

1937 **621 .33 (.44)**
Les Chemins de fer et les Tramways, juin, p. 145.
L'électrification de la ligne Paris-Le Mans. (400 mots & fig.)

1937 **621 .335 (.44)**
Les Chemins de fer et les Tramways, juin, p. 147.
Locomotives et automotrices pour la ligne Paris-Le Mans. (1 200 mots.)

1937 **621 .135.4**
Les Chemins de fer et les Tramways, juin, p. 151.
Vitesses de marche sur voies en courbe. (1 000 mots & fig.)

1937 **656 .254 (.44)**
Les Chemins de fer et les Tramways, juin, p. 152.
Dispositif **frotteur** stabilisé pour **prise de courant** mobile pour locomotives. (1 400 mots & fig.)

1937 **625 .142.2**
Les Chemins de fer et les locomotives, juin, p. 154.
Dispositif pour le **serrage** et le **cerclage des traverses.** (900 mots & fig.)

L'Industrie des voies ferrées et des transports automobiles. (Paris.)

1937 **621 .33**
L'Ind. des voies ferrées et des transp. autom., avril, p. 66.
SAUVAIRE. — Dispositif pour le contrôle de l'isolement des lignes et la localisation immédiate des **courts-circuits** dans un réseau de traction électrique. (2 200 mots & fig.)

1937 **385. (09 .3**
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GADOT (P.). — Le **centenaire des chemins de fer** à la Société des Ingénieurs civils de France. (3 100 mots.)

1937 625 .6 (.493)

L'Ind. des voies ferrées et des transp. autom., mai, p. 83.

La Société Nationale des **Chemins de fer vicinaux** de Belgique. (2 800 mots & fig.)

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1937 624 .32 (.493)

L'Ossature métallique, juin, p. 285.

DORLET (E.). — Les **ponts** de Wandre. (1 400 mots & fig.)

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1937 625 .232 (.44)

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BERTRAND. — Les **nouvelles voitures allégées** du Réseau de l'Etat. (4 200 mots & fig.)

1937 621 .135 (01 & 625 .14 (01

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CHAN. — **Efforts transversaux** exercés sur la voie par les locomotives 221.A et 231.D de la Compagnie P. L. M. (3 500 mots, 6 tableaux & fig.)

1937 385. (06 .4 (.44)

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Les chemins de fer à l'Exposition internationale de Paris — 1937. (1 500 mots.)

1937 385. (01 (.55)

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La **construction de chemins de fer** en Iran. (1 000 mots & fig.)

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1937 385

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DIVISIA (F.). — Les **chemins de fer** en 1936. (5 500 mots.)

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1937 669 .1

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DEHASSE (Ch.). — Le **durcissement de l'acier** par trempe superficielle oxy-acétylénique. (5 000 mots & fig.)

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1937 621 .43 (.44)

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de BOYSSON. — Les nouveaux **autorails** français. (5 000 mots & fig.)

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Traction nouvelle, mai-juin, p. 88.

DUMAS (L.). — **Prix de revient** de la traction nouvelle. (2 000 mots & fig.)

1937 621 .43 (.43

Traction nouvelle, mai-juin, p. 97.

STROEBE. — Les **automotrices** de la Reichsbahn. (5 300 mots & fig.)

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1937 351 (.43) & 385 .3 (.43

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KITTEL (Th.). — Die **Grundgedanken** der neue Reichsbahn-Gesetzgebung. (5 300 Wörter.)

1937 656 .23

Archiv für Eisenbahnwesen, März-April, S. 271.

TORK (A.). — **Selbstkosten- und Tarifprobleme** de Eisenbahnen. (8 300 Wörter & Abb.)

1937 385 .113 (.43

Archiv für Eisenbahnwesen, März-April, S. 295.

HARDT. — Allgemeiner Überblick über das **Geschäftsjahr 1936 der Deutschen Reichsbahn.** (2 700 Wörter.)

1937 621 .33 (.43

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KUNTZEMÜLLER (A.). — Die **Höllentalbahn** in Schwarzwald. (11 000 Wörter.)

1937 385 (.492

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OVERMANN. — Massnahmen zur **Vereinfachung** de **Verwaltung** und zur **Senkung der Betriebsausgaben** b den Niederländischen Eisenbahnen. (2 700 Wörter.)

1937 385 .113 (.494

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NITSCHKE. — Die **Schweizerischen Bundesbahnen** i Jahre 1935. (3 400 Wörter.)

1937 385 .113 (.489

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PASZKOWSKI. — Die **Dänische Staatsbahnen** unt besonderer Berücksichtigung der Geschäftsjahre 193 1935 und 1935-1936. (7 600 Wörter & Kaart.)

1937 385 .113 (.439

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WEHDE. — Die Königlich **Ungarischen Staatsbahne** in den Geschäftsjahren 1933-34 und 1934-35. (2 000 Wörter.)

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WERNEKKE. — **Eisenbahn und Strassenverkehr** Belgien. (2 000 Wörter.)

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BRUNO (L.). — Die **Eisenbahnen Griechenlands** in den Jahren 1932 bis 1934. (1 800 Wörter.)

1937 **385. (09 (.51)**
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PAUSIN. — Die **Mandschukuo-Staatseisenbahnen.** (4 000 Wörter.)

1937 **385. (09 (.55)**
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OLZSCHA (R.). — Die **Trans-Iranische Eisenbahn.** (2 000 Wörter.)

Die Lokomotive. (Wien.)

1937 **621 .134.2**
Die Lokomotive, Mai, S. 77.
STEFFAN (H.). — Neuere Ausführungen der **Lentz-ventilsteuerungen** für Lokomotiven. (3 800 Wörter & Abb.)

1937 **621 .132.1 (.68)**
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Südafrikanische Lokomotiven 1901-1936. I. (7500 Wörter & Abb.) (Schluss folgt.)

Die Reichsbahn. (Berlin.)

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1937 **625 .4 (.43)**
Die Reichsbahn, Heft 19, 12. Mai, S. 480.
GRABSKI (M.). — Vom Bau der **Berliner Nordsüd-S-Bahn.** (2 200 Wörter & Abb.)

1937 **351 .757 (.43)**
Die Reichsbahn, Heft 21, 26. Mai, S. 514.
Dr. DICHGANS. — Die Mitwirkung der **Bahnpolizei** im Strafverfahren. (5 800 Wörter.)

1937 **385 .57 (.43)**
Die Reichsbahn, Heft 23, 9 Juni, S. 550.
SCHUMANN. — **Beamtenlaufbahnen** bei der Deutschen Reichsbahn. (11 000 Wörter.)

1937 **656 .23 (.43)**
Die Reichsbahn, Heft 24, 16. Juni, S. 566.
JAEGER. — Neuregelung der **Reichsbahnreklame.** (4 500 Wörter & Abb.)

1937 **656 .234**
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FISCHL. — Das Spannungsverhältnis im **Personenverkehr.** (2 700 Wörter & 1 Tafel.)

Elektrische Bahnen. (Berlin.)

1937 **621 .335 (.43)**
Elektrische Bahnen, Heft 3-4, März-April, S. 53.
MICHEL (O.). — Die **elektrischen Lokomotiven** für 50 Hz. der **Höllental- und Dreiseenbahn.** (3 600 Wörter & Abb.)

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Elektrische Bahnen, Heft 3-4, März-April, S. 59.
HERMLE & PARTZSCH. — Die **elektrische Ausrüstung** der A. E. G.-Stromrichter-Lokomotive für die Höllentalbahn, Reihe 244, Nr. 0I. (5 800 Wörter & Abb.)

1937 **621 .335 (.43)**
Elektrische Bahnen, Heft 3-4, März-April, S. 68.
HUTT (H.). — **Elektrische Ausrüstung** der BBC-Gleichrichterlokomotive, Reihe E 244, Nr. II. (5 800 Wörter & Abb.)

1937 **621 .335 (.43)**
Elektrische Bahnen, Heft 3-4, März-April, S. 77.
HERRMANN (P.). — **Die elektrische Bo' Bo' Lokomotive,** Reihe 244, Nr. 21 der Siemens-Schuckertwerke für die Höllentalbahn. (5 000 Wörter & Abb.)

1937 **621 .335 (.43)**
Elektrische Bahnen, Heft 3-4, März-April, S. 86.
SCHÖN (L.). — **Die elektrische Krupp-Lokomotive,** Reihe 244, Nr. 31, für die Höllentalbahn. (5 300 Wörter & Abb.)

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Elektrische Bahnen, Heft 5, Mai, S. 101.
CURTIUS (E. W.). — **Messtechnische Untersuchung** der Reichsbahn-Schnellzugs-Lokomotive Reihe E 18 bei Schnellfahrten und Höchstleistungsfahrten. (2 600 Wörter & Abb.)

1937 **621 .33**
Elektrische Bahnen, Heft 5, Mai, S. 106.
SCHNEIDER (L.). — **Bahnbetrieb** mit Drehstrom niedriger Frequenz oder mit Gleichstrom hoher Spannung ? (800 Wörter & Abb.)

1937 **621 .333**
Elektrische Bahnen, Heft 5, Mai, S. 108.
KOTHER (H.). — Zeichnerisches Verfahren zur Vorausbestimmung der **betriebsmässigen Erwärmung elektrischer Maschinen,** insbesondere von Bahnmotoren. (9 600 Wörter, 10 Tafeln & Abb.)

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1937 **621 .13 (09 (.43)**
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METZELTIN. — **Lokomotivbetrieb** vor hundert Jahren. (1 800 Wörter & Abb.)

1937 **625 .2**
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BENNEDIK (K.). — Einige statisch unbestimmte Aufgaben aus dem **Eisenbahnwagenbau.** (6 400 Wörter & Abb.)

1937 656 .222

Glasers Annalen, Nr. 1439, 1. Juni, S. 129.

HAPPACH (M.). — Die Feststellung der **Laufleistung von Eisenbahnfahrzeugen** mittels Zählern, die am Achslagergehäuse angebaut sind. (6 200 Wörter, 4 Tafeln & Abb.) (Schluss folgt.)

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SCHRAMM (G.). — Entwicklung und Stand der **Übergangsbogenfrage.** (8 000 Wörter & Abb.)

1937 625 .17

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HERRMANN (M.). — Die **Messung der Gleisrichtung.** (2 800 Wörter & Abb.)

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RAAB (F.). — Grundsätzliches über **Bau** und **Betrieb** einer selbsttätigen Zulaufanlage. (3 000 Wörter & Abb.)

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FALCK (O.). — Hundert Jahre **Empfangsgebäude der sächsischen Eisenbahnen.** (3 300 Wörter & Abb.)

1937 621 .13 (09 (.43)

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METZELTIN. — Aus den Anfängen des deutschen **Lokomotivbaues.** (6 600 Wörter & Abb.)

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BAUD (R. V.). — Zur Ermittlung der im Steg von **Eisenbahnschienen** winkelrecht zur Längsrichtung wirkenden Oberflächenspannungen. (5 300 Wörter & Abb.)

1937 656 .211.7 (.42 + .44)

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WERNEKKE. — Die **Fährverbindung** Dover-Dünkirchen. (1 000 Wörter.)

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SZEMERE (J.). — Zur Frage des **Ausdehnungsstosses** und der **Schienenschweissung.** (700 Wörter.)

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SCHMITZ (W.). — **Rangierweichen-Schaltungen.** (2 900 Wörter & Abb.) (Fortsetzung folgt.)

1937 656 .257

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BECKH (H). — **Kraftstellwerke** der Vereinigten Eisenbahn-**Signalwerke.** (Bauart Siemens & Halske 1912) in Bayern. (3 700 Wörter & Abb.)

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BUCKEL (R.). — Untersuchung über die Beeinflussung von Sicherungsanlagen auf **Wechselstrombahnen.** (2 600 Wörter & Abb.)

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1937 385 .3 (.43)

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KITTEL (Th.). — Der **Neuaufbau der Deutschen Reichsbahn** nach dem Gesetz vom 10. Februar 1937. (2 000 Wörter.)

1937 385. (07.4 (.436)

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1937 656 .254 (.494)

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MÜLLER (W.). — **Zugbeeinflussung** bei den Schweizerischen Bundesbahnen. (2 700 Wörter & Abb.)

1937 385 .1 (.494)

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Die **Rationalisierungs- und Spaarmassnahmen** der Schweizerischen Bundesbahnen seit dem Jahre 1920 und ihre finanziellen Auswirkungen. (1 200 Wörter.)

1937 385 .1 (.43)

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BUSCH. — Die **Entwicklung der Reichsbahn-Finanzen** und des Reichsbahn-Finanzwesens seit 1933. (11 300 Wörter.)

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1937 656 .232

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1937 **33. (06**

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1937 **621 .392**

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HARRIS (H.). — **Metallic arc welding.** (2 000 words & fig.)

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CALWELL (J. E.). — **Overhead transmission lines.** The application of a wireless receiving set to routine maintenance. (1 700 words & fig.)

1937 **621 .335 (.4)**

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Storage battery cars. (800 words & fig.)

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1937 **624 .62 (.73)**

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Henry Hudson Bridge, New York. — No. II. (2 000 words & fig.)

1937 **621 .116 & 621 .118**

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DOREY (S. F.). — **Chemical intercrystalline fracture of riveted joints in boilers.** (2 300 words.)

1937 **621 .43 (.941)**

Engineer, No. 4239, April 9, p. 417.

Railcars for Western Australia. (1 800 words & fig.)

1937 **621 .31**

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The Petersen Coil. (3 800 words & fig.)

1937 **621 .132.8 (.65)**

Engineer, No. 4239, April 9, p. 426.

Beyer-Garratt locomotive : high speed record. (500 words & fig.)

1937 **669 .1 (06 (.42)**

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Iron and Steel Institute. — **Phosphorous Steel and corrosion.** — Steel sheets containing copper, manganese, chromium and phosphorus. (5 500 words.)

1937 **621 .43 (.42)**

Engineer, No. 4245, May 21, p. 594.

Oil-engined locomotive. (600 words.)

1937 **698**

Engineer, No. 4245, May 21, p. 604.

Alumino-bituminous paints. (400 words.)

1937 **62. (01 (06**

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1937 **621. (06 (08**

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1937 **621 .31**

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PARSONS (R. H.). — **The influence of load factor on power stations.** (2 200 words & 1 table.)

1937 **625 .1 (.931)**

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East Coast Railway, New Zealand. (800 words & fig.)

1937 **62. (01 (06**

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RUSSELL (R.). — **Force and shrink fits.** (5 000 words, tables & fig.)

1937 **621. (06 (∞)**

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Nervous breakdown in works. (3 000 words.)

1937 **621 .43 (.82)**

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1937 **656 .281 (.42)**

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Accident at Barford, L.N.E.R. (2 800 words.)

1937 **621 .392**

Engineer, No. 4247, June 4, p. 670.

An improved D. C. welder. (1 400 words & fig.)

1937 **625 .164 (.42)**

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Redecking of Avalanche Tunnel, Penmaenmawr, L.M.S. Ry. (600 words.)

1937 **621 .39 & 62. (01**

Engineer, No. 4249, June 18, p. 708.

An X-Ray service. (500 words & fig.)

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1937 **62. (01 & 621 .116**
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DOREY (S. F.). — Note on the **chemical intercrystalline fracture of riveted joints in boilers.** (2 500 words & fig.)

1937 **621 .43 & 621 .8**
Engineering, No. 3717, April 9, p. 401.
Diesel railcar transmission systems. (1 500 words.)

1937 **621 .116 & 662**
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SOEHNER (X). — **Power production** from tropical vegetable waste. (3 800 words & fig.)

1937 **624 .2**
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BATEMAN (E. H.). — **Remainder distribution** in the analysis of intermediate structures. (2 000 words & fig.)

1937 **621 .392**
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1937 **62. (01 (06**
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1937 **621 .43**
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1937 **621 .134.1 & 669 .1**
Engineering, No. 3723, May 21, p. 591.
O'NEILL (H.). — **Alloy and fine-grained steels** for locomotive coupling rods. (4 200 words & fig.)

1937 **693 & 721 .9**
Engineering, No. 3723, May 21, p. 593.
Moisture control in concrete aggregate by vibration. (700 words.)

1937 **621 .392 & 62. (01**
Engineering, No. 3723, May 21, No. 594.
Mercury-vapour hot-cathode stroboscopic tube. (1 300 words & fig.)

1937 **537 .8 & 621 .3**
Engineering, No. 3724, May 28, p. 597.
TRENCHAM (H.) and COX (H. E.). — The mechanism of **alternating-current circuit interruption.** (4 600 words & fig.)

1937 **62. (01**
Engineering, No. 3724, May 28, p. 620.
KOMMERS (J. B.). — **Overstressing and understressing in fatigue.** (2 900 words & fig.)

1937 **621 .392 & 721 .9**
Engineering, No. 3724, May 28, p. 623.
Welded structural-steel warehouse. (2 000 words & fig.)

Engineering News-Record. (New York.)

1937 **625 .4 (.73)**
Engineering News-Record, No. 18, May 6, p. 655.
New York's toughest subway job. (2 000 words & fig.)

1937 **721 .1**
Engineering News-Record, No. 18, May 6, p. 667.
VIERHELLER (H.). — Lateral loading tests made on steel bearing piles. (2 100 words & fig.)

1937 **624 .2 (.73)**
Engineering News-Record, No. 18, May 6, p. 671.
Continuous girders top rigid frame viaduct bents. (2 200 words & fig.)

1937 **55 & 721 .1**
Engineering News-Record, No. 19, May 13, p. 708.
EHRENBURG (D. O.). — **Measuring soil moisture.** (1 800 words & fig.)

1937 **625 .7 (.73)**
Engineering News-Record, No. 20, May 20, p. 733.
A count of road growth. (4 000 words & fig.)

1937 **621 .33 (.73) & 625 .4 (.73)**
Engineering News-Record, No. 21, May 27, p. 770.
PURCELL (C. H.), ANDREW (Ch. E.) and WOODRUFF (G. B.). — **Bay Bridge rapid transit system.** (3 000 words & fig.)

1937 **624 .8 (.73)**
Engineering News-Record, No. 21, May 27, p. 774.
Erecting 56-ton sheaves for Calumet River Bridge. (1 300 words & fig.)

1937 **624 .3 (.73) & 656 .286 (.73)**
Engineering News-Record, No. 21, May 27, p. 787.
HINCKLEY (W. O.). — Truss failure results from **using gusset plate as chord splice.** (500 words & fig.)

Great Western Railway Magazine. (London.)

1937 **625 .144.4 (.42)**
Great Western Railway Magazine, No. 6, June, p. 269.
The ballasting of railway track. (1 200 words & fig.)

Journal, Institute of Transport. (London.)

1937 **38 & 656**
Journal, Institute of Transport, No. 8, June, p. 137.
BELL (R.). — **Transport developments in 1936.** (7 000 words.)

Journal, Institute of Engineers, Australia. (Sydney, N. S. W.)

1937 **656 .212.6 & 725 .35**
Journal, Instit. of Engineers, Australia, No. 2, February, p. 45.
CHAPMAN (R. H.). — **Bulk handling of wheat.** (8 000 words, tables & fig.)

1937 **624 .62**
Journal, Instit. of Engineers, Australia, No. 2, February, p. 58.
BULL (M. G.). — **Model analysis of an Arch Span of 144 feet.** (7 500 words, tables & fig.)

1937 **537 .8 & 621 .31**
Journal, Instit. of Engineers, Australia, No. 2, February, p. 77.
MORSE (R. N.). — **A method of investigating the transient characteristics of electrical circuits.** (3 500 words & fig.)

Journal, Western Society of Engineers. (Chicago.)

1937 **621 .165**
Journal, Western Society of Engineers, No. 1, February, p. 31.
HAUSMANN (L.). — **High speed steam turbines.** (3 200 words & fig.)

Mechanical Engineering. (New York.)

1937 **621 .9**
Mechanical Engineering, No. 4, April, p. 221.
ERNST (H.) and KRONENBERG (M.). — **Grinding of cemented-carbide milling cutters.** (4 000 words & fig.)

1937 **621 .87 (.73)**
Mechanical Engineering, No. 4, April, p. 231.
BOWERMAN (M. R.). — **270-ton double-trolley Gantry crane** at Wheeler Dam. (800 words & fig.)

1937 **621 .134.5, 621 .135.2 & 625 .214**
Mechanical Engineering, No. 4, April, p. 235.
HUNTER (B. F.). — **Railway lubricants.** — Possibilities for their standardization. (4 300 words.)

1937 **621 .165 (093 (.73)**
Mechanical Engineering, No. 4, April, p. 239.
ROBINSON (E. L.). — The **steam turbine** in the United States. III. — Developments by the General Electric Company. (12 000 words & fig.)

1937 **608. (092**
Mechanical Engineering, No. 4, April, p. 263.
Engineering achievements of George Westinghouse. (14 000 words & fig.)

1937 **621 .8**
Mechanical Engineering, No. 5, May, p. 345.
KEYS (W. C.). — **Rubber springs.** (3 800 words & fig.)

Modern Transport. (London.)

1937 **621 .43 (.436)**
Modern Transport, No. 942, April 3, p. 3.
Diesel electric railcars for Australia. (1 600 words & fig.)

1937 **656 .225 (.42) & 625 .244 (.42)**
Modern Transport, No. 942, April 3, p. 5.
Transit of perishable traffic. (1 400 words & fig.)

1937 **656 (.53)**
Modern Transport, No. 942, April 3, p. 7.
Transport developments in Iracq. (1 700 words & fig.)

1937 **656**
Modern Transport, No. 943, April 10, p. 3.
DAVIES (A.). — **Road transport and the railways.** (3 000 words.)

1937 **621 .13 (.437)**
Modern Transport, No. 943, April 10, p. 5.
STRAUSS (F.). — **State-owned railways of Czechoslovakia.** — Locomotives and railcars. (1 400 words & fig.)

1937 **625 .232 (.51)**
Modern Transport, No. 943, April 10, p. 7.
All-steel rolling stock for China. (2 000 words & fig.)

1937 **625 .25, 656 .222.1 & 656 .25**
Modern Transport, No. 949, May 22, p. 3.
Speed in rail travel. — Operational requirements and safety precautions. (2 700 words.)

1937 **625 .232 (.44) & 656 .222 (.44)**
Modern Transport, No. 949, May 22, p. 4.
French suburban train working. — No. 2 — Economies by use of reversible steam trains. (1 900 words & fig.)

1937 **621 .43 (.437)**
Modern Transport, No. 949, May 22, p. 6.
Railcar transmission. — New petrol-electric system. (700 words & fig.)

1937 **621 .33 (.438)**
Modern Transport, No. 949, May 22, p. 7.
Electrification of Polish State Railways. (1 200 words & fig.)

1937 **385. (061.1**
Modern Transport, No. 950, May 29, p. 1.
International Railway Congress. (250 words & 1 photo.)

1937 **621 .132.3 (.42) & 625 .232 (.42)**
Modern Transport, No. 950, May 29, p. 3.
Rolling stock for L.M.S. « Coronation Scot ». — **Streamlined locomotives and luxury coaches.** (3 200 words & fig.)

1937 **621 .132.8**
Modern Transport, No. 950, May 29, p. 5.
Steam units for rail operation. — Projected « Sentinel » developments. (1 200 words.)

1937 **656 .222.1 (.42) & 656 .281 (.42)**
Modern Transport, No. 950. May 29, p. 5.
Freight vans on fast trains. (1 200 words.)

1937 **625 .23**
Modern Transport, No. 950, May 29, p. 9.
Double-deck suburban railway carriages. (1 800 words & fig.)

1937 **621 .33 (.438)**
Modern Transport, No. 950, May 29, p. 11.
Railway electrification in Poland. (5 800 words & fig.)

1937 **621 .43 & 656 .222 (.4)**
Modern Transport, No. 950, May 29, p. 16.
WIENER (L.). — **Continental railway speeds and services.** No. 1. — High speed railcars. (2 900 words & fig.)

1937 **621 .43 (.82)**
Modern Transport, No. 950, May 29, p. 22.
Railcars for Argentina. — First description of new Drewry units. (1 400 words & fig.)

1937 **621 .338 (.494)**
Modern Transport, No. 950, May 29, p. 23.
Electric railcar trains for Switzerland. (1 800 words & fig.)

1937 **621 .335 (.436)**
Modern Transport, No. 950. May 29, p. 25.
STRAUSS (F.). — **Electric railcars and light locomotives.** (1 200 words & fig.)

1937 **621 .132.8**
Modern Transport, No. 950. May 29, p. 26.
Turbine locomotives in freight service. (1 200 words & fig.)

1937 **621 .338 (.45)**
Modern Transport, No. 950, May 29, p. 27.
Streamlined electric trains in Italy. (1 100 words & fig.)

1937 **621 .43 (.44)**
Modern Transport, No. 950, May 29, p. 28.
Petrol-engined railcars in France — Three-coach unit with Cotal transmission. (1 000 words & fig.)

Proceedings, American Society of Civil Engineers. (New York.)

1937 **721 .1**
Proceedings, American Society of Civil Engineers, No. 4, April, p. 669.
KRYNINE (D. P.). — **Pressures beneath a spread foundation.** (8 500 words, fig. & tables.)

1937 **62. (01 & 725 .33**
Proceedings, American Society of Civil Engineers, No. 5, May, p. 801.
RUGE (A. C.). — **Earthquake resistance of elevated water-tanks.** (20 000 words, fig. & tables.)

Proceedings, Institution of Mechanical Engineers. (London.)

1936 **621 .116**
Proceedings, Institution of Mechanical Engineers, Vol. 134, November-December, p. 5.
MÜNZINGER (F.). — Modern forms of **water-tube boilers for land and marine use.** (20 000 words, fig. & tables.)

1936 **656 .221**
Proceedings, Institution of Mechanical Engineers, Vol. 134, November-December, p. 91.
JOHANSEN (F. C.). — The **air-resistance of passenger trains.** (35 000 words, fig. & tables.)

1936 **621 .31**
Proceedings, Institution of Mechanical Engineers, Vol. 134, November-December, p. 283.
SEEWER (P. W.). — Recent **developments in hydro-electric engineering** with special reference to British practice. (24 000 words & fig.)

1936 **536**
Proceedings, Institution of Mechanical Engineers, Vol. 134, November-December, p. 363.
STILL (E. W.). — Some factors affecting the **design of heat transfer apparatus.** (19 000 words, fig. & tables.)

1936 **621 .82**
Proceedings, Institution of Mechanical Engineers, Vol. 134, November-December, p. 437.
CLAYTON (D.) and JAKEMAN (C.). — **The measurement of altitude and eccentricity in complete clearance bearings.** (18 500 words, fig. & tables.)

1936 **62. (01**
Proceedings, Institution of Mechanical Engineers, Vol. 134, November-December, p. 507.
WARLAV-DAVIES (E. J.) and SOUTHWELL (R. V.). — The correlation of impact tests, and the problem of standardization. (11 000 words, fig. & tables.)

1936 **621 .83**
Proceedings, Institution of Mechanical Engineers, Vol. 134, November-December, p. 547.
LOVE (Ph. P.). — **Epicyclic gearing.** (7 000 words, fig. & tables.)

Railway Age. (New York.)

1937 **625 .232 (.73)**
Railway Age, No. 11, March 13, p. 418.
Southern Pacific alloy-steel passenger trains. (2 500 words & fig.)

1937 **625 .111 (.73), 625 .162 (.73) & 656 .259 (.73)**
Railway Age, No. 11, March 13, p. 425.
Federal **grade crossing program** is in full swing (3 000 words & fig.)

1937 **625 .111 (.73)**
Railway Age, No. 11, March 13, p. 430.
Santa Fé reduces curves on Chicago-Los Angeles line. (2 900 words & fig.)

1937 **656 .254 (.73)**
Railway Age, No. 11, March 13, p. 436.
Delaware & Hudson installs **centralized traffic control.** (1 900 words & fig.)

1937 **656 .254 (.73) & 656 .255 (.73)**
Railway Age, No. 11, March 13, p. 439.
Gauntlet signals on the B. & L. E. (1 300 words & fig.)

1937 **625 .143.2 (.73)**
Railway Age, No. 11, March 13, p. 447.
Gary plant equipped to brunorize rail. (900 words & fig.)

1937 **621 .132.3 (.73)**
Railway Age, No. 13, March 27, p. 540.
New Haven installs **streamline passenger locomotives.** (1 400 words, tables & fig.)

1937 **625 .111 (.73), 625 .162 (.73) & 656 .259 (.73)**
Railway Age, No. 13, March 27, p. 545.
MacDONALD (Th. H.). — **The grade crossing problem.** (3 300 words & fig.)

1937 **621 .139 (.73), 625 .18 (.73) & 625 .27 (.73)**
Railway Age, No. 13, March 27, p. 551.
Supply work highly organized on Santa Fé. (2 500 words, tables & fig.)

1937 **624 .7 (.73)**
Railway Age, No. 18, May 1, p. 746.
Devise novel composite deck for highway overcrossing. (1 200 words & fig.)

1937 **621 .139 (.73), 625 .18 (.73) & 625 .27 (.73)**
Railway Age, No. 18, May 1, p. 748.
New York Railroad club discusses **supply work.** (3 800 words & fig.)

1937 **625 .26 (.73)**
Railway Age, No. 18, May 1, p. 755.
NYSTROM (K. F.). — **Freight car maintenance** organized. (2 500 words & tables.)

1937 **656 .28 (0**
Railway Age, No. 18, May 1, p. 758.
PATTERSON (W. J.). — Who is responsible ? — Accidents do not just happen. — **Somewhere along the line there is always a mistake.** (3 400 words & fig.)

1937 **625 .111 (.73)**
Railway Age, No. 19, May 8, p. 784.
Relocations in Western Texas **overcome flood hazards.** (2 500 words & fig.)

1937 **621 .39 (.73), 625 .18 (.73) & 625 .27 (.73)**
Railway Age, No. 19, May 8, p. 788.
BEALE (G. O.). — **The modern purchasing and stores department.** (1 700 words & fig.)

1937 **625 .244 (.73)**
Railway Age, No. 19, May 8, p. 791.
Double-deck refrigerator car. (1 000 words & fig.)

1937 **621 .132.3 (.73)**
Railway Age, No. 20, May 15, p. 823.
Burlington builds **streamline steam locomotive.** (1 000 words & fig.)

1937 **621 .131.2 (.73) & 625 .14 (01 (.73)**
Railway Age, No. 20, May 15, p. 825.
MAGEE (G. M.). — **Locomotive design** and rail stresses. (3 500 words & fig.)

1937 **725 .33 (.73)**
Railway Age, No. 21, May 22, p. 855.
Santa Fé re-equips « super chief ». (6 000 words & fig.)

1937 **651 (.73) & 656 .237 (.73)**
Railway Age, No. 21, May 22, p. 867.
BUNTING (G. J.). — **Mass methods in accounting.** (3 800 words.)

1937 **625 .143.3 (.73)**
Railway Age, No. 21, May 22, p. 870.
GENNET (Ch. W.). — **Transverse fissure fractures.** (1 300 words & fig.)

1937 **614 .8 (06 (.73)**
Railway Age, No. 21, May 22, p. 872.
Safety section meets at St. Louis. (2 500 words.)

1937 **656 .261 (.73)**
Railway Age, No. 21, May 22, p. 874.
Transport Company regains traffic in Evangeline Land. (1 400 words & fig.)

1937 **656 .261 (.71)**
Railway Age, No. 21, May 22, p. 876.
Express trucks for railway service. (900 words & fig.)

1937 **656 .1 (.73) & 656 .261 (.73)**
Railway Age, No. 21, May 22, p. 879.
Rail-highway transport fast becoming a major industry. (500 words.)

1937 **725 .33 (.73)**
Railway Age, No. 22, May 29, p. 902.
North Western lays 6 1/2 miles of **transite pipe.** (4 600 words & fig.)

1937 **651 (.73)**
Railway Age, No. 22, May 29, p. 907.
New York Central consolidates **handling of stationery.** (1 200 words & fig.)

1937 **621 .43 (.73)**
Railway Age, No. 22, May 29, p. 911.
Two motor cars for C. & E. I. (1 800 words & fig.)

Railway Engineering and Maintenance. (Chicago.)

1937 **625 .144.4**
Railway Engineering and Maintenance, June, p. 404.
Manual rail laying gives way to mechanical methods on Norfolk & Western. (6 000 words & fig.)

1937 **625 .144.4 (.73) & 625 .173 (.73)**
Railway Engineering and Maintenance, June. p. 412.
Missouri Pacific lays rail with small gangs. (3 000 words & fig.)

Railway Gazette. (London.)

1937 **621 .133.7 (.91)**
Railway Gazette, No. 14, April 2, p. 654.
Water treatment on the Trans-Australian Railway. Successful application to locomotive water of new system previously restricted to stationary boiler supplies. (700 words & fig.)

1937 **621 .134.1 (.43)**
Railway Gazette, No. 14, April 2. p. 655.
Individual axle drive for high-speed steam locomotives. (600 words & fig.)

1937 **656 .253 (.42) & 656 .257 (.42)**
Railway Gazette, No. 14, April 2, p. 656.
New signalling at Brunswick, Cheshire Lines. (800 words & fig.)

1937 **385. (071.3 (.42) & 656 .25 (.42)**
Railway Gazette, No. 14, April 2, p. 659.
BIDDULPH (F. J.). — **Signal school** at the railway training centre, Royal Engineers, Longmoor. (800 words & fig.)

1937 **621 .132.3 (.42)**
Railway Gazette, No. 14, April 2, p. 661.
« Lord Nelson » class engine, No. 857, Southern Railway. (300 words & fig.)

1937 **625 .245 (.42)**
Railway Gazette, No. 14, April 2, p. 663.
G. W. R. vehicles for exceptional loads — IV. (4 fig.)

1937 **621 .132.1 (.42)**
Railway Gazette, No. 15, April 9, p. 700.
British locomotive types — VIII. London & North Eastern Railway. (6 figures.)

1937 **625 .26 (.42)**
Railway Gazette, No. 15, April 9, p. 705.
A modern bus overhaul works. (2 000 words & fig.)

1937 **625 .246 & 656 .1**
Railway Gazette, No. 15, April 9, p. 713.
New Dyson **road-rail milk tank containers.** (400 words & fig.)

1937 **621 .132.1 (.42)**
Railway Gazette, No. 21, May 21, p. 986.
British locomotive types. — XIII. Southern Railway. (6 figures.)

1937 **621 .134.4 (.44)**
Railway Gazette, No. 21, May 21, p. 988.
The evolution of the P.L.M. Pacific. (800 words & fig.)

1937 **625 .232 (.44)**
Railway Gazette, No. 21, May 21, p. 989.
New lightweight passenger stock, French State Railways. (200 words & fig.)

1937 **625 .14 (01**
Railway Gazette, No. 21, May 21, p. 992.
Track depression and rail stresses. (1 500 words.)

1937 **621 .91 (.42) & 621 .134.1**
Railway Gazette, No. 21, May 21, p. 993.
Grinding locomotive crank-pins. (200 words & fig.)

1937 **656 .222.1 (.44)**
Railway Gazette, No. 21, May 21, p. 999.
French train service accelerations. (1 200 words.)

1937 **385. (093**
Railway Gazette, No. 22, May 28, p. 1015.
LEE (Ch. E.). — **The evolution of railways** — III (3 500 words & fig.)

1937 **621 .132.3 (.42) & 625 .232 (.42)**
Railway Gazette, No. 22, May 28, p. 1019.
The **Coronation Scot, L.M.S.R.** (3 500 words & fig.)

1937 **621 .338 (.73)**
Electric Railway Traction, p. 682, Supplt. to the Railway Gazette, April 2.
Articulated trains for New York Subway. (3 000 words & fig.)

1937 **621 .338 (.485)**
Electric Railway Traction, p. 686, Supplt. to the Railway Gazette, April 2.
Oslo suburban electrification. (600 words & fig.)

1937 **621 .33 (.68**
Electric Railway Traction, p. 687, Supplt. to the Railway Gazette, April 2.
South African electrification notes. (800 words.)

1937 **621 .33 (.44**
Electric Railway Traction, p. 1045, Suppl. to the Railway Gazette, May 28.
Railway electrification in France. (1 100 words.)

1937 **621 .33 (.44**
Electric Railway Traction, p. 1046, Supplt. to the Railway Gazette, May 28.
First main-line electrification on French State Railways. (3 400 words & fig.)

Railway Mechanical Engineer. (New York.)

1937 **625 .2 (01 & 625 .24 (0**
Railway Mechanical Engineer, No. 3, March, p. 99.
MUSSEY (W. H.). — Dynamic stresses in **freight-car design.** (1 900 words & fig.)

1937 **621 .132.3 (.73)**
Railway Mechanical Engineer, No. 3, March, p. 103.
Streamline steam passenger locomotives. (1 600 words & fig.)

1937 **625 .235 (.73)**
Railway Mechanical Engineer, No. 3, March, p. 106.
Venetian blinds for passenger cars. (300 words & fig.)

1937 **62. (01, 621 .13 & 656 .284**
Railway Mechanical Engineer, No. 3, March, p. 107.
WILLIAMS (F. H.). — **Failures of locomotive parts.** (2 600 words & fig.)

1937 **621 .138 & 621 .43**
Railway Mechanical Engineer. No. 3, March, p. 111.
Diesel-electric locomotive **projected repair costs.** (1 200 words & fig.)

1937 **625 .234 (.73)**
Railway Mechanical Engineer, No. 3, March, p. 117.
A. A. R. passenger-car **air-conditioning report.** (3 400 words, tables & fig.)

1937 **313 : 625 .234 (.73)**
Railway Mechanical Engineer, No. 3, March, p. 124.
Seven-years of **air-conditioned cars.** (1 table.)

1937 **621 .134.1 (.43) & 621 .138 (.43)**
Railway Mechanical Engineer, No. 3, March, p. 133.
Hardening crosshead guides in salt-bath furnaces. (600 words, tables & fig.)

1937 **621 .132.3 (.73)**
Railway Mechanical Engineer, No. 5, May, p. 199.
New Haven streamline locomotives. (1 500 words & fig.)

1937 **621 .132.8 (.73) & 621 .335 (.73)**
Railway Mechanical Engineer, No. 5, May, p. 202.
U. P. to use steamotive units for **turbo-electric locomotive.** (4 000 words & fig.)

1937 **625 .245 (.73)**
Railway Mechanical Engineer, No. 5, May, p. 210.
Seaboard builds 70-ton **hopper cars for phosphate.** (1 100 words & fig.)

1937 **625 .244 (.73)**
Railway Mechanical Engineer, No. 5, May, p. 211.
Automatic heating system for refrigerator cars. (1 200 words & fig.)

1937 **385. (072 (.73) & 625 .214 (.73)**
Railway Mechanical Engineer, No. 5, May, p. 214.
Axles and bearings tested in **Timken research laboratory.** (1 200 words & fig.)

1937 **625 .232 (.73)**
Railway Mechanical Engineer, No. 5, May, p. 215.
Pullman remodels **sleeping-car facilities.** (1 100 words & fig.)

1937 **625 .244 (.73)**
Railway Mechanical Engineer, No. 5, May, p. 217.
Diesel engine powers mobile ice plant. (800 words & fig.)

1937 **625 .246 (.73)**
Railway Mechanical Engineer, No. 5, May, p. 224.
Milwaukee uses plywood extensively in new cars. (1 100 words & fig.)

Railway Signaling. (Chicago.)

1937 **656 .253 (.73)**
Railway Signaling, May, p. 271.
Signaling on the Wabash; modern equipment and construction methods used on 13-mile territory on new line. (2 000 words & fig.)

1937 **625 .162 (.73) & 656 .259 (.73)**
Railway Signaling, May, p. 273.
ZANE (W. F.). — **Burlington protects three crossings.** (1 600 words & fig.)

1937 **625 .162 (.73)**
Railway Signaling, May, p. 279.
Barriers on the Michigan Central. (4 500 words & fig.)

1937 **621 .39 (.73) & 656 .259 (.73)**
Railway Signaling, May, p. 283.
Railway signaling by wireless. (500 words & fig.)

1937 **656 .254 (.73) & 656 .259 (.73)**
Railway Signaling, May, p. 284.
Delaware River Bridge signaling. (7 500 words & fig.)

South African Railways and Harbours Magazine. (Johannesburg.)

1937 **625 .234**
South African Railways and Harbours Magazine, March, p. 297.
Air-conditioning of passenger trains (with special reference to the United States of America). (3 700 words & fig.)

The Locomotive. (London.)

1937 **621 .135 (01**
The Locomotive, No. 537, May 15, p. 133.
Locomotive centres of gravity. (1 400 words.)

1937 **621 .132.3 (.436)**
The Locomotive, No. 537, May 15, p. 134.
New 2-8-4 express locomotives, Austrian Federal Rys. (700 words & fig.)

1937 **621 .132.3 (.44)**
The Locomotive, No. 537, May 15, p. 136.
Hudson type locomotive, Northern Railway of France. (300 words & fig.)

1937 **621 .132.1 (.41)**
The Locomotive, No. 537, May 15, p. 138.
REED (K. H.) & FAYLE (H.). — **Recent developments of Irish locomotive practice,** Great Southern Railways. (2 300 words & fig.) (To be continued.)

1937 **621 .138.1 (.42)**
The Locomotive, No. 537, May 15, p. 142.
Exmouth Junction loco. depot, Southern Railway. (1 700 words & fig.)

1937 **621 .131.3 (.42)**
The Locomotive, No. 537, May 15, p. 143.
Dynamometer car trials on Midland Division, L.M.S.R. (2 400 words.)

1937 **385. (092**
The Locomotive, No. 537, May 15, p. 149.
ELLIS (C. H.). — **Famous locomotive engineers.** — I. William Stroudley. (3 300 words & fig.)

1937 **621 .132.5 (.725)**
The Locomotive, No. 537. May 15, p. 157.
4-8-0 passenger loco, National Railways of Mexico. (700 words & fig.)

1937 **621 .43 & 625 .253**
The Locomotive, No. 537, May 15, p. 158.
Railcar braking. (3 200 words & fig.)

1937 **621 .13 & 698**
The Locomotive, No. 537, May 15, p. 163.
Black paints for locomotives. (1 500 words.)

1937 **621 .132.3 (.42) & 625 .232 (.42)**
The Locomotive, No. 538, June 15, p. 168.
4-6-2 stream-lined express locomotive « Coronation » L.M.S.R. (4 500 words & fig.)

1937 **621 .43 (.42)**
The Locomotive, No. 538, June 15, p. 174.
Diesel-engined shunting locomotive, for Nobel's. (800 words.)

1937 **621 .132.3 (.73)**
The Locomotive, No. 538, June 15, p. 175.
Stream-lined 4-8-4 type locomotives, Southern Pacific Railway. (1 000 words & fig.)

1937 **621 .132.1 (.44)**
The Locomotive, No. 538, June 15, p. 177.
Modern French locomotive practice. (3 800 words & fig.)

1937 **621 .132.8 (.81)**
The Locomotive, No. 538, June 15, p. 183.
Articulated locomotive, Goyaz Railway of Brazil. (500 words.)

1937 **621 .133.5 (.44)**
The Locomotive, No. 538, June 15, p. 184.
The Lemaitre improved exhaust system, Northern Railway of France. (2 100 words & fig.)

1937 **621 .33 (.43)**
The Locomotive, No. 538, June 15, p. 187.
Electrification of the Hollental Railway, Germany. (3 000 words & fig.)

The Oil Engine. (London.)

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(OCTOBER 1937)

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Paris et Liége, Librairie Polytechnique Ch. Béranger. 1 volume, 181 pages et 53 figures. (Prix : 59.40 francs belges.)

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Paris, Institut de Soudure Autogène, 32, boulevard de la Chapelle. 1 volume (0.16 × 0.24), 135 pages et 151 figures. (Prix : 15 francs français.)

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La Compagnie du **Nord français** en 1936. (2 700 mots.)

1937 **385 .1 (.44)**
Chronique des transports, n° 14, 25 juillet, p. 2.
Les **décrets-lois et les transports.** (2 500 mots.)

Electricité. (Paris.)

1937 **621 .33 (.44)**
Electricité, juin, p. 215.
LABORDE (M.). — **L'électrification** de la ligne du Mans des Chemins de fer de l'Etat. (3 300 mots & fig.)

1937 **656 .256**
Electricité, juillet, p. 261.
WALTER (J.). — Comment l'électricité accroît sur les chemins de fer la **sécurité des transports.** (4 600 mots & fig.) (A suivre.)

Génie civil. (Paris.)

1937 **62. (01 & 669**
Génie civil, n° 2862, 19 juin, p. 542.
DEJEAN (P.) et SIMARD (P.). — Valeur de l'essai de choc simplifié pour mesurer la **fragilité** des barres rondes en **acier** ordinaire. (2 900 mots, 4 tableaux & fig.

1937 **385. (06 .112**
Génie civil, n° 2862, 19 juin, p. 546; n° 2863, 26 juin p. 569.
DUMAS (J.). — Le **XIIe Congrès international des chemins de fer.** (Paris, 1er-11 juin.) (13 600 mots.)

1937 **621 .132.8 (.44) & 621 .43 (.44)**
Génie civil, n° 2863, 26 juin, p. 561.
Locomotive Diesel-électrique de 4 400 ch., de la Compagnie des chemins de fer P.-L.-M. (1 900 mots & fig.)

1937 **624 .5**
Génie civil, n° 2864, 3 juillet, p. 8; n° 2865, 10 juillet p. 34; n° 2866, 17 juillet, p. 56; n° 2867, 24 juillet p. 77.
PIGEAUD (G.). — Réflexions nouvelles sur les **ponts suspendus.** (16 000 mots & fig.)

1937 **621 .134.**
Génie civil, n° 2864, 3 juillet, p. 19.
Biellage léger, système Timken, pour **locomotives** à **vapeur.** (1 200 mots & fig.)

1937 **669**
Génie civil, n° 2864, 3 juillet, p. 20.
CHARPY (G.). — La définition de la « nuance » des **aciers.** (1 200 mots.)

1937 **621 .33 (.44**
Génie civil, n° 2865, 10 juillet, p. 29.
DUMAS (J.). — L'inauguration de la **traction électrique** sur la ligne Paris-Le Mans des Chemins de fer de l'Etat (10 juin 1937). (4 500 mots & fig.)

1937 **62. (01 & 669**
Génie civil, n° 2865, 10 juillet, p. 45.
GUILLET (L.) & BALLAY (M.). — Les fragilités revenu des **aciers.** (1 000 mots.)

1937 **691**

Génie civil, n° 2866, 17 juillet, p. 61.

L'action **corrosive** des différents sols sur les métaux non ferreux et leurs alliages. (700 mots.)

1937 **662. (06 (.44)**

Génie civil, n° 2866, 17 juillet, p. 60; n° 2867, 24 juillet, p. 84.

BERTHELOT (Ch.). — Le IIe Congrès mondial du pétrole (Paris, 14-21 juin 1937.) (10 700 mots.)

1937 **621 .43 (.44)**

Génie civil, n° 2866, 17 juillet, p. 87.

Autorail Renault, type ABV, à deux moteurs de 300 chevaux. (1 000 mots & fig.)

1937 **625 .213 (.44)**

Génie civil, n° 2868, 31 juillet, p. 97; n° 2869, 7 août, p. 129.

BEAU. — La **gare maritime** de la Compagnie Générale transatlantique, au Havre. (11 500 mots & fig.)

1937 **621 .43 (.44)**

Génie civil. n° 2869, 7 août, p. 121; n° 2870, 14 août, p. 141.

MARTIN (H.). — Les nouvelles **automotrices** des Chemins de fer français. **Automotrices** à transmissions mécanique et électrique. (11 200 mots & fig.)

1937 **62. (01**

Génie civil, n° 2869, 7 août, p. 126.

ROGOFF (A.). — Le calcul des **poutres métalliques** enrobées en **béton**. (5 500 mots & fig.)

1937 **693**

Génie Civil, n° 2870, 14 août, p. 146.

LEMAIRE (E.). — L'amélioration du **ciment** magnésien par l'addition de cuivre métallique. (3 800 mots & fig.)

1937 **624 .63 (.460)**

Génie civil, n° 2871, 21 août, p. 161.

JACOBSON (M.). — Le viaduc en **béton armé** avec arc de 210 m. de portée, sur l'Esla (Espagne). (5 300 mots & fig.)

1937 **625 .171 (.44)**

Génie civil, n° 2871, 21 août, p. 175.

VIE (G.). — L'**automotorail** des Chemins de fer du P. L. M. pour le service de la voie. (600 mots & fig.)

1937 **621 .43**

Génie civil, n° 2872, 28 août, p. 186.

DERI (G.). — Moteurs **Diesel,** système Ganz-Jendrassik. (3 600 mots & fig.)

L'Allégement dans les transports. (Lucerne.)

1937 **625 .216**

L'Allègement dans les transports, juillet-août, p. 102.

HUG (Ad.). — Diminution du **risque d'accidents** dans l'exploitation avec véhicules sur rails. (1 600 mots & fig.) (A suivre.)

La Science et la Vie. (Paris.)

1937 **691 & 669**

La Science et la Vie, septembre, p. 171.

HOULLEVIGUE (L.). — La **corrosion des métaux** devant la recherche scientifique. (4 800 mots & fig.)

La Technique moderne. (Paris.)

1937 **621 .43 (.489)**

La Technique moderne, n° 12, 15 juin, p. 412.

CHATEL. — **Autorails Diesel** électriques des Chemins de fer de l'Etat danois. (1 900 mots & fig.)

1937 **621 .33 (.43)**

La Technique moderne, n° 12, 15 juin, p. 425.

Les progrès récents de l'**électrification** des chemins de fer en Allemagne. (2 600 mots & fig.)

1937 **621 .9**

La Technique moderne, n° 13, 1er juillet, p. 451.

Les **machines-outils** pour travail des métaux en 1937. (7 700 mots & fig.)

1937 **621 .392**

La Technique moderne, n° 13, 1er juillet, p.470.

VOLFF (Ch.). — Le choix d'une installation de **soudure à l'arc.** Les centrales de soudure. (5 000 mots & fig.)

1937 **62. (01**

La Technique moderne, n° 14, 15 juillet, p. 501.

LAMBRETTE (A.). — Congrès de l'Association internationale pour l'**essai des matériaux.** (5 000 mots, 3 tableaux & fig.)

1937 **621 .33 (.43)**

La Technique moderne, n° 14, 15 juillet, p. 509.

Essais de **traction** à 50 périodes/seconde sur la ligne de l'Höllental. (2 500 mots & fig.)

1937 **624 .61 (.44)**

La Technique moderne, nos 15 et 16, 1er et 15 août, p. 521.

La reconstruction du **pont** de Neuilly sur la Seine. (3 600 mots & fig.)

La Traction électrique. (Paris.)

1936 **621 .33 (.493)**

La Traction Electrique, novembre-décembre, p. E. 367.

DUQUESNE (E.). — L'**Electrification** de la ligne Bruxelles-Anvers de la S. N. C. F. B., avec le courant continu à 3 000 volts. (Suite.) (4 000 mots & fig.)

1936 **625 .253**

La Traction Electrique, novembre-décembre, p. E. 377.

CHRISTEN (F.). — Die **Führerbremsventile** für die selbsttätige Druckluftbremse. (3 200 mots & fig.)

Le Container. (Paris.)

1937 — 385 .6 & 656 .225

Le Container, juillet, p. 2.

DANCO (W.). — **Réglementation tarifaire** pour les containers en trafic international. (6 000 mots.)

1937 — 656 .225 & 656 .261

Le Container, juillet, p. 16.

Union Internationale des chemins de fer. **Tarif type** pour le transport des marchandises en containers et des containers vides en trafic international. Edition du 1er janvier 1935. (2 700 mots.)

1937 — 656 .225 & 656 .261

Le Container, juillet, p. 23.

Association des Administrations des **chemins de fer** de l'Europe Centrale. (2 200 mots.)

1937 — 656 .225 (.43 & .493) & 656 .261 (.43 & .493)

Le Container, juillet, p. 33.

Les moyens de propagande utilisés en Allemagne et en Belgique pour étendre l'emploi des **containers**. (1 700 mots.)

Les Chemins de fer et les Tramways. (Paris.)

1937 — 621 .132.3 (.44)

Les Chemins de fer et les Tramways, juillet, p. 165.

Locomotives type Hudson 2-3-2 de la Compagnie du Chemin de fer du Nord. (800 mots & fig.)

1937 — 621 .132.8 (.66)

Les Chemins de fer et les Tramways, juillet, p. 166.

Locomotive Beyer-Garratt 2-3-2 + 2-3-2 du Sudan Railway. (1 300 mots & fig.)

1937 — 621 .43

Les Chemins de fer et les Tramways, juillet, p. 167.

Nouveaux **moteurs Diesel** pour la traction. (1 000 mots & fig.)

1937 — 656 .212.5

Les Chemins de fer et les Tramways, juillet, p. 170.

Signalisation des buttes de triage. (1 500 mots & fig.)

1937 — 625 .23

Les Chemins de fer et les Tramways, juillet, p. 172.

Perfectionnements aux compartiments à couloir latéral. (1 400 mots & fig.)

1937 — 621 .43

Les Chemins de fer et les Tramways, juillet, p. 174.

Limitation automatique de la puissance demandée à un **moteur à combustion interne**. (1 500 mots & fig.)

1937 — 621 .138.3

Les Chemins de fer et les Tramways, juillet, p. 176.

Appareil de lavage des locomotives. (1 200 mots & fig.)

1937 — 621 .133.4

Les Chemins de fer et les Tramways, juillet, p. 177.

Extraction et utilisation du **fraisil**. (3 000 mots & fig.)

1937 — 621 .134.3

Les Chemins de fer et les Tramways, juillet, p. 181.

Surchauffeur à rayonnement pour locomotives. (1 300 mots & fig.)

L'Industrie des voies ferrées et des transports automobiles. (Paris.)

1937 — 621 .43 (.44)

L'Ind. des voies ferrées et des transp. autom., juin, p. 108.

Le réseau du Var (Toulon à Saint-Raphaël, Cogolin Saint-Tropez) des Chemins de fer de la Provence et ses autorails Diesel électriques. (3 900 mots & fig.)

1937 — 656 .28

L'Ind. des voies ferrées et des transp. autom., juillet, p. 131.

OTTOZ. — **Responsabilité** des Compagnies de chemin de fer dans les **accidents** survenus aux passages à niveau. (3 300 mots.)

1937 — 656 (.43

L'Ind. des voies ferrées et des transp. autom., juillet, p. 134.

MANCE (Sir H. Osborne). — **L'organisation des transports** en Allemagne. (1 200 mots.)

L'Ossature métallique. (Bruxelles.)

1937 — 625 .1 (.493) & 625 .13 (.49

L'Ossature métallique, juillet-août, p. 324.

FRANCHIMONT (E.). — La **jonction ferrovi**[aire] Nord-Midi à Bruxelles. (2 600 mots & fig.)

Revue générale des chemins de fer. (Paris.)

1937 — 621 .132.8 (.44) & 621 .43 (.

Revue générale des chemins de fer, juillet, p. 3.

TOURNEUR. — Les deux **locomotives Diesel-éle**[ctri]ques à grande vitesse du réseau P. L. M. (3 900 mo[ts &] fig.)

1937 — 621 .131.3 & 621 .1

Revue générale des chemins de fer, juillet, p. 14.

GAUBERT (H.). — Relevé des **diagrammes dyn**[amo]**métriques** sur les cylindres des locomotives. (2 000 [mots] & fig.)

1937 — 385. (07 .13

Revue générale des chemins de fer, juillet, p. 25.

BOILLOT. — **L'instruction professionnelle** des a[gents] leurs sur le réseau de l'Etat. Le wagon-école. (1 700 [mots] & fig.)

1937 **385. (06 .112**

Revue générale des chemins de fer, juillet, p. 29.

FLAMENT, DUMAS, RIDET, GILMAIRE, DUGAS & DELILLE.

La XIII^e Session du Congrès international des chemins de fer. (14 300 mots.)

1937 **656 .254**

Revue générale des chemins de fer, juillet, p. 57.

VINOT. — La lutte contre les accidents de **passages à niveau.** (1 300 mots & fig.)

1937 **385 .113 (.44)**

Revue générale des chemins de fer, août, p. 69.

KIPFER. — Les **grands réseaux** de chemins de fer français en 1936. (14 000 mots.)

1937 **656 .211 (.44) & 656 .212 (.44)**

Revue générale des chemins de fer, août, p. 96.

LANG (H.). — La **nouvelle gare** de Mulhouse. (4 200 mots & fig.)

1937 **625 .251**

Revue générale des chemins de fer, août, p. 108.

PEDELUCQ. — Le **freinage** des trains G. V. poids-freins voyageurs et formule de freinage. (4 700 mots & fig.)

Revue universelle des Mines. (Liége.)

1937 **669**

Revue universelle des mines, juillet, p. 281.

DAWANS (A.). — Comment obtenir des **fontes** résistant aux températures élevées. (6 200 mots & fig.)

1937 **624 .62 (.493)**

Revue universelle des mines, août, p. 325.

MORESSEE (G.). — Les **ponts** Vierendeel soudés sur le canal Albert. (5 800 mots & fig.)

Traction nouvelle. (Paris.)

1937 **621 .43**

Traction nouvelle, juillet-août, p. 118.

LEVY (J.). — La question des **autorails** au Congrès international de Paris. (6 000 mots & fig.)

1937 **621 .43 (.44 + .493)**

Traction nouvelle, juillet-août, p. 132.

Inauguration des **services rapides** Paris-Bruxelles et Paris-Liége. (1 100 mots & fig.)

1937 **621 .43 (.73)**

Traction nouvelle, juillet-août, p. 134.

Les **automotrices rapides** américaines. Un an de progrès. (4 000 mots & fig.)

1937 **621 .43 (.44)**

Traction nouvelle, juillet-août, p. 150.

GARIN & RENAULT. — Le jumelage des **autorails** P. L. M. (1 500 mots & fig.)

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In German.

Archiv für Eisenbahnwesen. (Berlin.)

1937 **662**

Archiv für Eisenbahnwesen, Mai-Juni, S. 519.

BERGMANN (W.). — Kohle, Elektrizität und Öl, die Energieträger für den **Eisenbahnbetrieb.** (6 000 Wörter.)

1937 **625 .162 & 656 .254**

Archiv für Eisenbahnwesen, Mai-Juni, S. 571.

LAMP. — Der **Wegübergang** in Schienenhöhe, seine Gefahren und deren Bekämpfung. (5 500 Wörter & Abb.)

1937 **656 .2 (.43)**

Archiv für Eisenbahnwesen, Mai-Juni, S. 591.

MEYER (R.). — **Reichsbahn und Werbung.** (3 400 Wörter & Abb.)

1937 **621 .33 (.43)**

Archiv für Eisenbahnwesen, Mai-Juni, S. 603.

NADERER (G.). — Die **Elektrisierung** Nürnberg-Halle/Leipzig. (4 500 Wörter.)

1937 **656**

Archiv für Eisenbahnwesen, Mai-Juni, S. 615.

PIRATH (C.). — Der **Luftverkehr** als technisches und wirtschaftliches Problem. (6 800 Wörter.)

1937 **625 .2 & 669**

Archiv für Eisenbahnwesen, Mai-Juni, S. 655.

THUM (A.). — Leichtbau durch werkstoffgerechtes Gestalten. (5 000 Wörter & Abb.)

Die Lokomotive. (Wien.)

1937 **621 .132.1 (.68)**

Die Lokomotive, Juli, S. 117.

Die **Lokomotiven** der Südafrikanischen Staatsbahnen 1901-1936. II. (3 400 Wörter & Abb.)

1937 **621 .33 (.436)**

Die Lokomotive, Juli, S. 124.

HELLER (E.). — Die weitere **Elektrifizierung** der Oe. B. B. (1 000 Wörter.)

1937 **385. (09 (.42)**

Die Lokomotive, August, S. 137.

PENNOYER (E.). — Ein **Jahrhundert** englische Westbahn. I. (2 800 Wörter & Abb.) (Fortsetzung folgt.)

1937 **621 .33 (.436)**

Die Lokomotive, August, S. 143.

SCHURFF (H.). — Die Vorgeschichte der **Elektrifizierung** der Österreichischen Bundes-Bahnen. (1 900 Wörter.)

Die Reichsbahn. (Berlin.)

1937 656 .261 (.43)
Die Reichsbahn, Heft 25, 23. Juni, S. 582.
TRIERENBERG. — **Haus-Haus-Verkehr** der Deutschen Reichsbahn. (4 900 Wörter.)

1937 656 .225 (.43)
Die Reichsbahn, Heft 25, 23. Juni, S. 587.
DREYER. 10 **Jahre leichte Güterzüge** (Leig). (2 200 Wörter & Abb.)

1937 625 .13 (.43)
Die Reichsbahn, Heft 28, 14. Juli, S. 644.
REICHERT. — Eine **betriebsgefährliche Rutschung** am Voreinschnitt des Schlüchterner Tunnels und ihre Beseitigung durch Wasserentziehung. (4 000 Wörter & Abb.)

1937 621 .132.6 (.43)
Die Reichsbahn, Heft 33, 18. August, S. 744.
MAUCK. — Umgebaute **Personenzug-Tenderlokomotive** bei der Lübeck-Büchener Eisenbahn für den Vorortverkehr Hamburg Hof-Ahrensburg mit doppelstökkigen Zugeinheiten. (1 000 Wörter & Abb.)

1937 656 .21 (.43)
Die Reichsbahn, Heft 34, 25. August, S. 762.
SOLTAU. — Betrachtung zur Einrichtung von **Betriebsüberwachung** für Bahnhöfe der Reichsbahndirektion Berlin. (5 400 Wörter & Abb.)

Elektrische Bahnen. (Berlin.)

1937 621 .33 (.3)
Elektrische Bahnen, Heft 6, Juni, S. 127.
Die Entwicklung der **elektrischen Zugförderung** der Welt im Jahre 1936. (1 500 Wörter.)

1937 621 .33 (.436)
Elektrische Bahnen, Heft 6, Juni, S. 129.
KAAN. — Die Ausdehnung des **elektrischen Zugbetriebes** der Österreichischen Bundesbahnen auf die Teilstrecke Salzburg-Linz der Linie Salzburg-Wien. (1 400 Wörter & Abb.)

1937 621 .332 (.436)
Elektrische Bahnen, Heft 6, Juni, S. 131.
SCHMIDT (H.). — Die künftige **Energie-Versorgung** der Strecke Salzburg-Wien. (1 800 Wörter & Abb.)

1937 621 .335 (.436)
Elektrische Bahnen, Heft 6, Juni, S. 134.
OREL (W.). — Die Lokomotiven für die zu **elektrisierende Strecke** Salzburg-Linz. (1 000 Wörter & Abb.)

1937 621 .33 (.42)
Elektrische Bahnen, Heft 6, Juni, S. 140.
FAIRBURN (C. F.). — Der **elektrische Betrieb** der London Midland & Scottish Railway Company. (8 300 Wörter & Abb.)

1937 621 .332 (.489
Elektrische Bahnen, Heft 6, Juni, S. 152.
MERKMANN (G.). — Die **Fahrleitungsanlagen** de Kopenhagener Nahverkehrsstrecken. (700 Wörter Abb.)

1937 621 .33 (.481
Elektrische Bahnen, Heft 6, Juni, S. 154.
SCHREINER (H.). — **Elektrische Zugförderung** i Norwegen. (1 200 Wörter & Abb.)

1937 621 .33 (.485
Elektrische Bahnen, Heft 6, Juni, S. 156.
SCHAEFER (H. H.). — Die Entwicklung der swedi schen Staatsbahnen im Zeitraum 1932 bis 1936, unte besonderer Berücksichtigung der **elektrischen Zugförde rung**. (1 500 Wörter & Abb.)

1937 621 .33 (.44
Elektrische Bahnen, Heft 6, Juni, S. 158.
Elektrische Zugförderung im Pariser Vorortverkel der französischen Staatseisenbahnen. (800 Wörter Abb.)

1937 621 .33 (.4
Elektrische Bahnen, Heft 6, Juni, S. 160.
Elektrische Zugförderung bei der englischen Süd-E senbahn. (1 300 Wörter.)

1937 621 .
Elektrische Bahnen, Heft 7, Juli, S. 163.
SELDMAYR (K.). — **Betriebsdiagramme** für Ge ratoren mit Verbrennungskraftmaschinenantrieb. (13 Wörter & Abb.)

1937 621 .
Elektrische Bahnen, Heft 7. Juli, S. 182.
GRABINSKI (Z.). — Eine graphische Methode Fahrzeit-Berechnung **elektrischer Züge**. (4 300 Wörte Abb.)

Glasers Annalen. (Berlin.)

1937 656 .
Glasers Annalen, Heft 12, 15. Juni, S. 141.
HAPPACH (M.). — Die Feststellung der Laufleist von Eisenbahnfahrzeugen mittels Zählern, die am A lagergehäuse angebaut sind. (6 600 Wörter & Abb.)

1937 621 .1
Glasers Annalen, Heft 1, 1. Juli, S. 2.
NORDMANN. — Die Entwicklung des **Lokomotiv- suchswesens**. (8 200 Wörter.)

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Glasers Annalen, Heft 1. 1. Juli, S. 9.
WITTE (Fr.). — Eiselachsantrieb bei **Dampflok tiven**. (5 300 Wörter & Abb.)

1937 621 .132.7
Glasers Annalen, Heft 1, 1. Juli, S. 15.
JESSEN (H.). — Betriebsbewährung und Weit wicklung der **Einheitsmotorkleinlokomotiven** der schen Reichsbahn. (2 100 Wörter & Abb.)

1937 **621 .43**
Glasers Annalen, Heft 1, 1. Juli, S. 17.
BREUER. — Die Rückkühlung und Wärmeregelung des Kühlwassers der **Dieseltriebwagen.** (5 700 Wörter & Abb.)

1937 **625 .62**
Glasers Annalen, Heft 1, 1. Juli, S. 24.
LENGERKE (A. von). — Erhöhung der **Geschwindigkeit** bei Strassenbahnen. (2 400 Wörter & Abb.)

1937 **621 .9**
Glasers Annalen, Heft 1, 1. Juli, S. 29.
WILCKE. — Neuzeitliche **Werkzeugmaschinen** in den Eisenbahnwerkstätten : Bohr-Hobel- und Fräsmaschinen. (5 800 Wörter & Abb.)

1937 **621 .133.3**
Glasers Annalen, Heft 1, 1. Juli, S. 40.
KÜHNEL (R.). — Gleichartige Oberflächenrostzerstörung von Kesselteilen verschiedenartigen Werkstoffs und ihre Ursachen. (2 400 Wörter & Abb.)

1937 **621 .135.2 & 625 .212**
Glasers Annalen, Heft 2, 15. Juli, S. 45.
KALLEN (H.) & NIENHAUS (H.). — Anwendung der Oberflächenhärtung bei Achsen und Wellen von Schienenfahrzeugen. (2 100 Wörter & Abb.)

1937 **385 .113 (.43)**
Glasers Annalen, Heft 2, 15. Juli, S. 48.
Aus dem **Geschäftsbericht** der Deutschen Reichsbahn Gesellschaft über das 12. Geschäftsjahr (1936). (5 300 Wörter.)

1937 **385 .113 (.42 + .44 + .73)**
Glasers Annalen, Heft 3, 1. August, S. 57.
WERNEKKE. — Die **Eisenbahnen** Frankreichs, Englands und der Vereinigten Staaten im Jahre 1936. (9 300 Wörter.)

Organ für die Fortschritte des Eisenbahnwesens. (Berlin.)

1937 **621 .133.5**
Organ für die Fortschr. des Eisenbahnw., Heft 13, 1. Juli, S. 231.
MEINEKE (F.). — Bericht über Versuche mit neueren **Blasrohrformen.** (3 200 Wörter & Abb.)

1937 **621 .135 (01 & 625 .22**
Organ für die Fortschr. des Eisenbahnw., Heft 13, 1. Juli, S. 236.
MEINEKE (F.). — Der heutige Stand des **Schlingerproblems.** (2 000 Wörter.)

1937 **621 .135.4 & 625 .215**
Organ für die Fortschr. des Eisenbahnw., Heft 13, 1. Juli, S. 238.
HEUMANN. — Liechtys Studien über das bogenläufige **Eisenbahnfahrzeug** und Messungen über die Spurführung bogenläufiger Eisenbahnfahrzeuge. (2 400 Wörter & Abb.)

1937 **621 .135.2 & 625 .212**
Organ für die Fortschr. des Eisenbahnw., Heft 13, 1. Juli, S. 241.
LABRIJN (P.). — Versuchsweise Bestimmung der zur Entgleisung eines führenden Rades nötigen Kraft. (700 Wörter & Abb.)

1937 **621 .133.5**
Organ für die Fortschr. des Eisenbahnw., Heft 13, 1. Juli, S. 244.
Versuche mit dem verstellbaren Blasrohr von Lemaître. (700 Wörter & Abb.)

1937 **621 .134.1**
Organ für die Fortschr. des Eisenbahnw., Heft 13, 1. Juli, S. 245.
Lokomotiv-Hilfsdampfmaschine der Skoda-Werke in Pilsen. (800 Wörter & Abb.)

1937 **621 .132.8**
Organ für die Fortschr. des Eisenbahnw., Heft 13, 1. Juli, S. 246.
Auspuff-Turbolokomotiven Bauart Ljungström. (1 300 Wörter & Abb.)

1937 **621 .392, 621 .132.8 & 621 .43**
Organ für die Fortschritte des Eisenbahnw., Heft 14, 15. Juli, S. 249.
TASCHINGER (O.). — Entwicklung und gegenwärtiger Stand im Bau geschweisster **Triebsteuer- und Beiwagen.** (9 900 Wörter & Abb.)

1937 **621 .43 (.492)**
Organ für die Fortschritte des Eisenbahnw., Heft 14, 15. Juli, S. 261.
HUPKES (Fr. W.). — Die dreiteiligen **Triebwagenzüge** mit elektrischer Kraftübertragung der Niederländischen Eisenbahnen. (2 800 Wörter & Abb.)

1937 **625 .245 (.43)**
Organ für die Fortschritte des Eisenbahnw., Heft 15, 1. August, S. 269.
KOEHNE. — Neue **Kranwagen** der Deutschen Reichsbahn. (8 100 Wörter & Abb.)

1937 **621 .135.4 & 625 .215**
Organ für die Fortschritte des Eisenbahnw., Heft 15, 1. August, S. 279.
TROITZSCH (E.). — Schnellbestimmung der **Betriebswiderstände,** der seitlichen Schienenabnutzungen und der Entgleisungsgrenze in Krümmungen. (3 000 Wörter & Abb.)

1937 **625 .25**
Organ für die Fortschritte des Eisenbahnw., Heft 16, 15. August, S. 289.
BURGER (W.). — Unterhaltung der **Bremsen** im Reichsbahnausbesserungswerk Neuaubing. (6 000 Wörter & Abb.)

1937 **656 .212.5**
Organ für die Fortschritte des Eisenbahnw., Heft 16, 15. August, S. 298.
HOLFELD (W.). — Die Hauptablaufanlage der **Gefällbahnhöfe** bei flacher Geländegestaltung. (4 500 Wörter & Abb.)

1937 **621 .132.3 (.92)**
Organ für die Fortschritte des Eisenbahnw., Heft 16, 15. August, S. 304.

Die **Stromlinienlokomotive** der Niederländischen Eisenbahnen. (2,400 Wörter & Abb.)

Verkehrstechnische Woche. (Berlin.)

1936 **656 (.43)**
Verkehrstechnische Woche, Nr. 27, S. 345.

EBHARDT. — **Organischer Aufbau** des Verkehrs (Stand : Ende Mai 1936) (Schluss). (5 1/2 Seiten & Tafeln.)

1936 **625 .234 (.73)**
Verkehrstechnische Woche, Nr. 28, S. 357.

SCHAEFER. — Neuzeitliche Luftaufbereitung in den **Personen-Fahrzeugen** der U. S. A.-Bahnen. (6 Seiten & Abb.)

1936 **625 .4 (09 (.43)**
Verkehrstechnische Woche, Nr. 30-31, S. 383.

REMY. — Die Geschichte der Berliner Nordsüd-S-Bahn. (3 Seiten.)

1936 **625 .4 (.43)**
Verkehrstechnische Woche, Nr. 30-31, S. 386.

RÖBE. — Die Bedeutung der Berliner Nordsüd-S-Bahn in baulicher und betrieblicher Beziehung. (4 Seiten & Karten.)

1936 **621 .335 (.43)**
Verkehrstechnische Woche, Nr. 32, p. 443.

Die **Wechselstrom-Fahrzeuge** der Deutschen Reichsbahn. (4 1/2 Seiten & Abb.)

1936 **656 .222.5 (.43)**
Verkehrstechnische Woche, Nr. 33, S. 451.

TECKLENBURG. — **Zugbildungspläne** der Reisezüge bei der Deutschen Reichsbahn. (5 1/2 Seiten & Tafeln.)

1936 **388 (.42)**
Verkehrstechnische Woche, Nr. 34, S. 463; Nr. 35, S. 480.

MATTERSDORFF. — Die **Zusammenfassung** des Londoner Personen-Verkehrs. (15 Seiten, Karten & Abb.)

1936 **625 .62**
Verkehrstechnische Woche, Nr. 35, S. 475; Nr. 36, S. 494.

STEIN. — Zur Frage der **Geschwindigkeitserhöhung** bei Strassenbahnen. (8 Seiten.)

1936 **625 .113 (.43)**
Verkehrstechnische Woche, Nr. 36, S. 487.

SCHRAMM. — Die **Gestaltung der Gleisbögen** bei hohen Geschwindigkeiten. (Versuche der Deutschen Reichsbahn.) (7 Seiten & Abb.)

1936 **656 .222.1**
Verkehrstechnische Woche, Nr. 37, S. 499.

BULLEMER. — **Fahrplanmässige Höchstgeschwindigkeiten** auf der Schiene. (3 Seiten, Tafeln & diagr.)

1936 **656 .222**
Verkehrstechnische Woche, Nr. 39/40, S. 541.

WAGNER. — Lokomotivtechnische Verkehrungen z
Erhöhung der Fahrgeschwindigkeit. (5 Seiten & Abb.)

1936 **621 .131**
Verkehrstechnische Woche, Nr. 39-40, S. 546.

NORDMANN. — Versuche mit **Dampflokomotiven** f
hohe Geschwindigkeiten. (8 Seiten, Diagr. & Abb.)

1936 **625 .2 & 656 .222**
Verkehrstechnische Woche, Nr. 39-40, S. 554.

LICHTENFELD. — Die Anforderungen des **Schne**
verkehrs auf der Schiene an den Eisenbahnwagenba
(6 Seiten.)

1936 **627 .82 (.43 + .4**
Verkehrstechnische Woche, Nr. 41, S. 563.

LUTHER. — Bedeutung des **Rügendammes** für d
Deutsch-Skandinavischen Reisezugdienst. (4 Seiten

1936 **625 .2 & 6**
Verkehrstechnische Woche, Nr. 42-44, S. 584.

BERGMANN. — Neuzeitliche **Fahrzeugtechnik**
Verkehrsmittel der Schiene und Strasse. (7 1/2 Seit

1936 **656 .1 (.**
Verkehrstechnische Woche, Nr. 42-44, S. 600.

DOLL. — Die Fertigstellung der ersten 1 000
Reichsautobahnen in Deutschland im Jahre 1936
Seiten, Karte & Abb.)

1936 **385 (**
Verkehrstechnische Woche, Nr. 42-44. S. 610.

KITTEL. — Die Einheit der deutschen Eisenba
als Grundlage einer gesamtdeutschen **Verkehrspo**
(5 Seiten.)

1936
Verkehrstechnische Woche, Nr. 45, S. 615.

KOENIG. — Der **Monopolgedanke im Verkehrsw**
(6 Seiten.)

1936
Verkehrstechnische Woche, Nr. 48, S. 651.

NEESEN. — Der Einfluss der **Geschwindigke**
den technischen und kostenmässigen Aufwand de
kehrsmittel. (5 1/2 Seiten & Diagr.)

1936 **62**
Verkehrstechnische Woche, Nr. 49, S. 663.

STROEBE. — Erfahrungen mit **Dieselelekt**
Schnelltriebwagen in Bau und Betrieb. (7 Seiten,
Karte & Abb.)

1936 **656**
Verkehrstechnische Woche, Nr. 50, S. 675.

WESEMANN. — Die heutige Stellung des g
chen **Güterfernverkehrs.** (5 Seiten.)

1936 **6**
Verkehrstechnische Woche, Nr. 50, S. 679.

PAROW. — Wie verhütet man **Unfälle an de**
zungspunkten von Eisenbahn und Strasse ? (4 S

1936 **625 .25 & 656 .222.1**
'erkehrstechnische Woche. Nr. 51, S. 687.
RECKEL. — Die Anforderung des **Schnellverkehrs** auf ler Schiene an die Bremstechnik der Eisenbahnfahr-;euge. (9 1/2 Seiten, Diagr. & Abb.)

Zeitschrift des Vereines Deutscher Ingenieure (Berlin.)

1937 **62. (01 & 669 .1**
Zeitschr. des Ver. deutsch. Ing., Nr. 27, 3. Juli, S. 821.
Verhalten des **Stahles** bei höheren Temperaturen unter vechselnder Zugbeanspruchung. (800 Wörter & Abb.)

1937 **625 .213**
Zeitschr. des Ver. deutsch. Ing., Nr. 28, 10. Juli, S. 844.
BÜRGER. — Berechnung von **Blattfedern** mit ungleichen Blattdicken. (700 Wörter & Abb.)

1937 **62. (01**
Zeitschr. des Ver. deutsch. Ing., Nr. 29, 17. Juli, S. 862.
HOLTSCHMIDT (O.). — Eigenartige Erscheinungen bei der **magnetischen Werkstoffprüfung.** (1 800 Wörter & Abb.)

1937 **62. (01 & 621 .392**
Zeitschr. des Ver. deutsch. Ing., Nr. 30, 24. Juli, S. 883.
CORNELIUS (H.). — Die Dauerfestigkeit von **Schweissverbindungen.** (5 300 Wörter & Abb.)

1937 **62. (01 & 69**
Zeitschr. des Ver. deutsch. Ing., Nr. 32, 7. August, S. 929.
UDE (H.). — Die **Werkstoff-Forschung** als Grundlage der Konstruktion. (6 000 Wörter.)

1937 **625 .244 (.43)**
Zeitschr. des Ver. deutsch. Ing., Nr. 32, 7. August, S. 947.
TASCHINGER (O.). — Neue **Kühlwagen** der Deutschen Reichsbahn. (1 000 Wörter.)

1937 **665 .882**
Zeitschr. des Ver. deutsch. Ing., Nr. 34, 21. Aug., S. 995.
Links- und Rechtsschweissung bei der **Gasschmelzschweissung.** (1 000 Wörter & Abb.)

1937 **621 .165**
Zeitschr. des Ver. deutsch. Ing., Nr. 35, 28. Aug., S. 1005.
PAUL (H.). — Auswirkung der **Dampffeuchtigkeit** in den Niederdruckstufen auf Betrieb und Bau von Kondensationsturbinen. (3 600 Wörter & Abb.)

1937 **62. (01**
Zeitschr. des Ver. deutsch. Ing., Nr. 35, 28. Aug., S. 1013.
THUM (A.) & BERGMANN (G.). — **Dauerprüfung** von **Formelementen** und **Bauteilen** in natürlicher Grösse. (5 800 Wörter & Abb.)

Zeitschrift für das gesamte Eisenbahn-Sicherungs- und Fernmeldewesen. (Berlin.)

1937 **656 .257**
Zeitschr. für das ges. Eisenb.-Sicherungs- und Fernmeldewesen, Nr. 9, 10. Juli, S. 113; Nr. 10, 1. Aug., S. 127; Nr. 11, 20. August, S. 140.
SCHMITZ (W.). — **Rangierweichen-Schaltungen.** (3 500 Wörter & Abb.)

1937 **656 .256**
Zeitschr. für das ges. Eisenb.-Sicherungs- und Fernmeldewesen, Nr. 10, 1. August, S. 119.
BUDDENBERG (A.). — **Schienenstromschliesser.** (4 000 Wörter & Abb.) (Fortsetzung folgt.)

1937 **656 .257**
Zeitschr. für das ges. Eisenb.-Sicherungs- und Fernmeldewesen, Nr. 11, 20. August, S. 131.
KLEINSCHMIDT (H.). — Das **Stellwerk** als Hochbau. (4 000 Wörter & Abb.)

Zeitung des Vereins mitteleuropäischer Eisenbahnverwaltungen. (Berlin.)

1937 **385 (.43)**
Zeitung des Ver. mitteleurop. Eisenbahnverw., Nr. 24, 25. Juni, S. 441.
SCHUBERT. — Die Deutsche Reichsbahn « **betriebsökonomisch** » ? (5 500 Wörter & Abb.)

1937 **656 .211.5 (.43)**
Zeitung des Ver. mitteleurop. Eisenbahnverw., Nr. 24, 25. Juni, S. 448.
BEHNES. — Das neue **Empfangsgebäude** Düsseldorf Hbf. (900 Wörter & Abb.)

1937 **656 .224 (.43 + .438)**
Zeitung des Ver. mitteleurop. Eisenbahnverw., Nr. 26, 1. Juli, S. 457.
HOLTZ. — Die Neuordnung des Eisenbahnverkehrs über oberschlesische **Grenzübergänge.** (3 700 Wörter.)

1937 **385. (09 (.485)**
Zeitung des Ver. mitteleurop. Eisenbahnverw., Nr. 26, 1. Juli, S. 461.
PASZKOWSKI (F.). — Die Entwicklung der schwedischen **Privatbahnen** in den Jahren 1931-1935. (3 600 Wörter & Abb.)

1937 **656 (.67)**
Zeitung des Ver. mitteleurop. Eisenbahnverw., Nr. 27, 8. Juli, S. 480.
Der Wettbewerb von **Kraftwagen** und Schienenweg im Mandatsgebiet Deutsch-Ostafrika. (4 200 Wörter & Abb.)

1937 **656**
Zeitung des Ver. mitteleurop. Eisenbahnverw., Nr. 27, 8. Juli, S. 486.
Zur Frage **Eisenbahn-Kraftwagen.** (900 Wörter.)

1937 **656 .24**
Zeitung des Ver. mitteleurop. Eisenbahnverw., Nr. 28, 15. Juli, S. 493.
OLOFSSON (C.). — Die Haftung für **Güterverpackung.** (1 900 Wörter.)

1937 **385 .113 (.42)**
Zeitung des Ver. mitteleurop. Eisenbahnverw., Nr. 28, 15. Juli, S. 495.
Die britischen **Eisenbahnen** im Jahre 1936. (8 300 Wörter.)

1937 **385 (.59)**

Zeitung des Ver. mitteleurop. Eisenbahnverw., Nr. 28, 15. Juli, S. 504.

FÜRBRINGER (G.). — Die Transindonesische Eisenbahn, **verkehrspolitisch** gesehen. (1 400 Wörter & Abb.)

1937 **656 (.43)**

Zeitung des Ver. mitteleurop. Eisenbahnverw., Nr. 29, 22. Juli, S. 513.

SOMMERLATTE. — **Verkehrsfragen.** (6 700 Wörter & Abb.)

1937 **385. (09 (.6)**

Zeitung des Ver. mitteleurop. Eisenbahnverw., Nr. 29. 22. Juli, S. 522.

Der **Kap-Kairo-Weg.** (2 000 Wörter & Abb.)

1937 **656**

Zeitung des Ver. mitteleurop. Eisenbahnverw., Nr. 29. 22. Juli, S. 525.

Zur Frage **Eisenbahn-Kraftwagen.** (1 400 Wörter.)

1937 **656 .224 (.43)**

Zeitung des Ver. mitteleurop. Eisenbahnverw., Nr. 30. 29. Juli, S. 533.

REINBRECHT. — **Nahverkehrsfragen** des Ruhrbezirks. (4 000 Wörter.)

1937 **656 .224 (.492)**

Zeitung des Ver. mitteleurop. Eisenbahnverw., Nr. 30. 29. Juli, S. 538.

TISSOT van PATOT. — Ein **Jahrhundert** Regelung der Beförderung von Personen im Strassenverkehr in den Niederlanden. (3 200 Wörter.)

1937 **656 .237 (.43)**

Zeitung des Ver. mitteleurop. Eisenbahnverw., Nr. 31. 5. August, S. 547; Nr. 32. 12. August. S. 565.

KELLER. — Die **Rechnungsvorschrift über Leistungen** für die Deutsche Reichsbahn (Relei). (8 200 Wörter.)

1937 **385 .113 (.436)**

Zeitung des Ver. mitteleurop. Eisenbahnverw., Nr. 31. 5. August. S. 551.

Geschäftsbericht der Österreichischen Bundesbahnen 1936. (2 400 Wörter.)

1937 **656 .1 (.494)**

Zeitung des Ver. mitteleurop. Eisenbahnverw., Nr. 33. 19. August. S. 584.

WANNER (F.). — Die neue bundesrechtliche Ordnung des **Automobiltransportes** in der Schweiz. (4 200 Wörter.)

1937 **625 .3 (.43) & 621 .33 (.43)**

Zeitung des Ver. mitteleurop. Eisenbahnverw., Nr. 34. 26. August. S. 601.

SCHMITT & MÜMPFER. — **50 Jahre** Höllentalbahn. (5 000 Wörter & Abb.)

In English.

Bulletin, American Railway Engineering Association. (Chicago, III.)

1937 **625 .1 (06 (.73)**

Bulletin, Americ. Ry. Engineering Association, No. 395, March, p. 7.

Outline of work and personel of Committees — 1937 (9 000 words.)

1937 **625 .143.3 (.73)**

Bulletin, Americ. Ry. Engineering Association, No. 395, March, p. 57.

MOORE (H. F.). — Third progress report on the **investigation of fissures in railroad rails.** (8 000 words & fig.)

1937 **625 .1 (06 & 625 .14 (01**

Bulletin, Americ. Ry. Engineering Association, No. 395. March, p. 87.

Discussion on stresses in railroad track. (3 500 words & fig.)

Electrical Industries. (London.)

1937 **621 .31 (.42)**

Electrical Industries, No. 1886, June 2, p. 727.

Facts and figures. — **A statistical analysis of the costs in the generation of electricity in Great Britain.** (1 200 words & tables.)

1937 **625 .233**

Electrical Industries, No. 1888, June 16, p. 786.

Indirect lighting for public vehicles. (1 100 words & fig.)

1937 **656 .215 (.42)**

Electrical Industries, No. 1889, June 23, p. 813.

Lighting a large dock. (2 700 words & fig.)

1937 **621 .3**

Electrical Industries, No. 1891. July 7, p. 881.

Meters. A review of recent progress and present types. (4 300 words & fig.)

1937 **621 .3**

Electrical Industries, No. 1891. July 7, p. 886.

PHILLIPS (L. W.). — **Progress in electrical instruments.** (5 000 words & fig.)

1937 **621 .18 & 621 .39**

Electrical Industries, No. 1891. July 7, p. 892.

Boiler house instruments. (2 500 words & fig.)

1937 **621 .33 (.68)**

Electrical Industries, No. 1892, July 14, p. 917.

Natal Railways of South Africa. 25 new 1 200 h. p. Metrovick electric locomotives. (2 800 words & fig.)

1937 **621 .33 (.42)**

Electrical Industries, No. 1892, July 14, p. 926.

Southern Railway electrification. (2 500 words & fig.)

Engineer. (London.)

1937 **385. (061 .1**
Engineer, No. 4250, June 25, p. 722.
International Railway Congress. Paris meeting. (7 400 words & fig.)

1937 **621 .33 (.68)**
Engineer, No. 4250, June 25, p. 726.
New electric locomotives for the Natal Railways. (2 000 words & fig.)

1937 **536**
Engineer, No. 4251, July 2, p. 3.
RUDORFF (D. W.). — The analysis of **superheater problems.** (4 000 words & fig.)

1937 **51. (08**
Engineer, No. 4251, July 2, p. 6, and No. 4252, July 9, p. 36.
Mechanised mathematics. (8 800 words & fig.)

1937 **614 .5**
Engineer, No. 4251, July 2, p. 9.
Mosquito Control Engineering. (3 900 words & fig.)

1937 **621 .33 (.42)**
Engineer, No. 4251, July 2, p. 17.
The Southern Railway's **electrified extension to Portsmouth.** (3 800 words & fig.)

1937 **656 .222.1 (.42)**
Engineer, No. 4252, July 9, p. 39.
Test runs of « Coronation » trains. (3 500 words & fig.)

1937 **656 .222.1 (.42)**
Engineer, No. 4252, July 9, p. 45.
High-speed trains. (1 400 words.)

1937 **656 .25 (.42) & 656 .28 (.42)**
Engineer, No. 4252, July 9, p. 45.
Railway signalmen's releases. (1 200 words.)

1937 **621 .43 (.42)**
Engineer, No. 4252, July 9, p. 52.
An **oil-engined locomotive** for the B. C. D. R. (700 words & fig.)

1937 **621 .132.3 (.42)**
Engineer, No. 4253, July 16, p. 79.
New L. M. S. « Coronation » locomotives. (2 000 words & fig.)

1937 **621 .13 (.42), 621 .43 (.42) & 625 .23 (.42)**
Engineer, No. 4253, July 16, p. 80.
Mechanical and electrical traction equipments. (English Electric Company.) (1 400 words & fig.)

1937 **625 .1 (.44) & 656 .28 (.42)**
Engineer, No. 4253, July 16, p. 84.
Defective permanent way. (900 words.)

1937 **614 .8 & 721 .1**
Engineer, No. 4254, July 23, p. 93.
BOYCOTT (G. W. M.). — **Diving research and its** application to Caisson and Tunnel Work. (2 800 words & tables.)

1937 **621 .135.1 (.44)**
Engineer, No. 4254, July 23, p. 107.
Locomotive air screen look-out. (500 words.)

1937 **621 .138.5 (.42)**
Engineer, No. 4254, July 23, p. 109.
Locomotive weighing machines on the L. N. E. R. (900 words & fig.)

1937 **656 .25 (.42)**
Engineer, No. 4254, July 23, p. 123.
Power signalling at New Station, Leeds. (4 000 words & fig.

1937 **656 .257**
Engineer, No. 4154, July 23, p. 129.
Power-operated signal-boxes. (1 200 words.)

1937 **669 .3 & 669 .4**
The Metallurgist, p. 33, Supplt. to the Engineer, June 25.
Lead bronzes. (1 800 words.)

1937 **669 .1**
The Metallurgist, p. 37, Supplt. to The Engineer, June 25.
MILEY (H. A.). — **Iron oxide films.** (1 100 words.)

1937 **669**
The Metallurgist, p. 39, Supplt. to the Engineer, June 25.
Hardening of silicon-aluminium alloys. 1 100 words & fig.)

1937 **669 .1**
The Metallurgist, p. 40, Supplt. to the Engineer, June 25.
The effect of hydrogen on steel. (2 000 words & fig.)

1937 **669 .1**
The Metallurgist, p. 43, Supplt. to The Engineer, June 25.
The alloys of iron and nickel. (2 800 words.)

1937 **62. (01, 621 .39 & 669 .1**
The Metallurgist, p. 46, Supplt. to The Engineer, June 25.
MONYPENNY (J. H. G.). — The **use of polarised light in the microscopical examination of iron and steel.** (3 000 words.)

Engineering. (London.)

1937 **536**
Engineering, No. 3725, June 4, p. 629.
HODKINSON (B.). — **The flow of hot water through a nozzle.** (3 000 words & fig.)

1937 621 .132.3 (.42) & 625 .232 (.42)
Engineering, No. 3725, June 4, p. 633.

The « Coronation Scot » express, L. M. S. Railway. (2 300 words & fig.)

1937 669 .1 (06 (.42)
Engineering, No. 3725, June 4, p. 641.

The Iron and Steel Institute. Phosphorous in Low-Carbon and Low-alloy structural steels. Iron-carbon constitutional diagram. Alloys of iron research. Steels sheets containing copper, manganese, chromium, and phosphorous. (5 600 words.)

1937 621 .43 (.42)
Engineering, No. 3725, June 4, p. 644.

275-H.P. oil engine railcars with mechanical transmission. (2 200 words & fig.)

1937 536
Engineering, No. 3725, June 4, p. 647, and No. 3727, June 18, p. 703.

YELLOTT (J. I.) and HOLLAND (C. K.). — The condensation of flowing steam : condensation in diverging nozzles. (4 000 words & fig.)

1937 621 .39 & 62. (01
Engineering, No. 3726, June 11, p. 660.

Radiography in general industry. (600 words & fig.)

1937 621 .137 & 656 .222
Engineering, No. 3726, June 11, p. 666.

Extended locomotive runs. (1 800 words.)

1937 385. (061 .1
Engineering, No. 3726, June 11, p. 668; No. 3727, June 18, p. 698; No. 3728, June 25, and No. 3729, July 2, p. 3.

The International Railway Congress, Paris. (21 000 words.)

1937 62. (01 & 669
Engineering, No. 3726, June 11, p. 673.

GOUGH (H. J.) and SOPWITH (D. G.). — The influence of the mean stress of the cycle on the resistance of metals to corrosion-fatigue. (Paper read before the Iron and Steel Institute, on Thursday, April 29, 1937. Abridged.) (2 500 words & fig.)

1937 62. (01
Engineering, No. 3726, June 11, p. 676.

KOMMERS (J. B.). — Overstressing and understressing in fatigue. (7 000 words & tables.)

1937 621 .43
Engineering, No. 3727, June 18, p. 681.

Internal-combustion engines for alternative fuels. (3 400 words & fig.)

1937 621 .43
Engineering, No. 3727, June 18, p. 685.

DAVIES (S. J.). — The characteristics of engines of Kadenacy design. (8 000 words & fig.)

1937 625 .164 (.42)
Engineering, No. 3727, June 18, p. 709.

Re-decking the Penmaenmawr Avalanche tunnel, London Midland & Scottish Railway. (500 words.)

1937 62. (01 & 669
Engineering, No. 3729, July 2, p. 5.

WELTER (G.) and BUKALSKI (A.). — The effect of vibrations on the tensile properties of metals. (2 300 words & fig.)

1937 621 .132.3 (.42)
Engineering, No. 3729, July 2, p. 8, and No. 3731, July 16, p. 70.

The 4-6-2 « Coronation » class locomotives, L. M. S. R. (2 100 words & fig.)

1937 621 .33 (.42)
Engineering, No. 3729, July 2, p. 10.

The electrification of the Southern Railway to Portsmouth. (4 500 words & fig.)

1937 621 .335 (.68)
Engineering, No. 3729, July 2, p. 23.

1 200-H.P. 0-4 + 4-0 electric locomotives for the Natal Railways. (1 600 words & fig.)

1937 691
Engineering, No. 3729, July 2, p. 29.

Ground-line preservation of wood-poles. (700 words.)

1937 621 .132.3 (.42) & 625 .232 (.42)
Engineering, No. 3730, July 9, p. 40.

« Coronation » train on the L.N.E.R. (1 600 words & fig.)

1937 624 .2
Engineering, No. 3731, July 16, p. 62, and No. 3733, July 30, p. 116.

PROCTER (A. N.). — The solution of buckling problems by an approximate method. (4 200 words & fig.)

1937 62. (01 & 669
Engineering, No. 3731, July 16, p. 77, and No. 3733, July 30, p. 129.

Properties of metals at high temperatures. Creep. Pipe flanges and bolted connections, etc. (Proceedings of the National Physical Laboratory.) (6 500 words & fig.)

1937 656 .283 (.42)
Engineering, No. 3731, July 16, p. 80.

The Railway accident at Battersea Park. (800 words.)

1937 621 .138.5 (.42)
Engineering, No. 3731, July 16, p. 80.

Locomotive-weighing machines on the L. N. E. R. (900 words & fig.)

1937 665 .882
Engineering, No. 3731, July 16, p. 84.

The Rightward method of oxy-acetylene welding. (1 000 words.)

1937 62. (01 & 669 .1
Engineering, No. 3732, July 23, p. 87.

LEA (F. C.). — The effect of discontinuities and surface conditions on failure under repeated stress. (3 600 words & fig.) (To be continued.)

1937 **665 .882**
Engineering, No. 3732, July 23, p. 107.
Pipe welding by the multiflame method. (1 500 words & fig.)

1937 **385. (08 (.54)**
Engineering, No. 3733, July 30, p. 127.
The Indian Railway inquiry. (1 700 words.)

Engineering News-Record. (New York.)

1937 **625 .111 (.73)**
Engineering News-Record, No. 23, June 10, p. 863.
Reclaiming a river front. — Cooperation between New York City and New York Central R. R. brings vast changes along Hudson River shoreline; latest work involves track covering, express highway building and park development along a 7 mile front. (6 000 words & fig.)

1937 **625 .13 (.73)**
Engineering News-Record, No. 24, June 17, p. 901.
New road under the Hudson, (4 500 words & fig.)

1937 **624 .51 (.73)**
Engineering News-Record, No. 24, June 17, p. 912.
McCULLOUGH (C. B.) and ARCHIBALD (R.). — **Self-anchored eyebar cable bridge.** (1 400 words & fig.)

1937 **624 .63 (.73)**
Engineering News-Record, No. 25, June 24, p. 939.
DUNFORD (J. A.). — **Record rigid-frame bridge.** (3 000 words & fig.)

1937 **625 .13 (.73)**
Engineering News-Record, No. 25, June 24, p. 949.
Fast subaqueous tunnel driving. New record for shield tunneling set on Lincoln Tunnel at New York through innovations in handling of muck and iron lining, use of mechanical bolt tightener and remarkable coordination of driving operations. (4 800 words & fig.)

1937 **694**
Engineering News-Record, No. 1, July 1, p. 17.
SCRIPTURE (Ed. W.). — **Workability of concretes and mortars.** (6 500 words & fig.)

1937 **625 .13 (.73)**
Engineering News-Record, No. 2, July 8, p. 53.
BOWMAN (W G..). — **Bridge building follows flood.** (5 200 words & fig.)

1937 **627**
Engineering News-Record, No. 2, July 8, p. 67.
CRUSE (R. E.). — **Structures to control torrents.** (4 100 words & fig.)

1937 **625 .13 (.73)**
Engineering News-Record, No. 3, July 15, p. 105.
BOWMAN (W. G.). — **Bridge engineer's odyssey** (4 600 words & fig.)

1937 **625 .13 (.73)**
Engineering News-Record, No. 4, July 22, p. 141.
Fast work on large shafts. (2 100 words & fig.)

1937 **625 .13 (.73)**
Engineering News-Record, No. 4, July 22, p. 149.
BOWMAN (W. G.). — **Bridgebuilding down East.** (4 000 words & fig.)

Journal, Institute of Transport. (London.)

1937 **385. (09 (.43)**
Journal Institute of Transport, No. 9, July, p. 359.
ARKLE (E. W.). — **The German Railways.** (6 500 words.)

Journal, Institution of Civil Engineers. (London.)

1937 **721 .4**
Journal, Institution of Civil Eng., No. 7, June, p. 4.
« The mechanics of the Voussoir Arch. » (11 000 words & fig.)

1937 **627 .82 (.73)**
Journal, Institution of Civil Eng., No. 7, June, p. 161.
SAVAGE (J. L.). — **The Boulder dam.** (9 000 words & fig.)

1937 **624. (.43)**
Journal, Institution of Civil Eng., No. 7, June, p. 203.
SCHAPER (G.). — **New German bridges.** (4 200 words & fig.)

1937 **624 .2**
Journal, Institution of Civil Eng., No. 7, June, p. 247.
GOUGH (G. S.). — **The open-frame girder.** (2 500 words, tables & fig.)

1937 **536**
Journal, Institution of Civil Eng., No. 7, June, p. 263.
DOWSON (R.). — **The indicator-diagram** and its interpretation. (2 000 words.)

1937 **691 & 693**
Journal, Institution of Civil Eng., No. 7, June, p. 272.
Engineering research. Measurements of free shrinkage and of shrinkage-cracking. Comparison of methods for measuring the heat of hydration of cements. The testing of pozzolanic cements. (4 000 words & tables.)

Journal, Institution of Engineers, Australia. (Sydney.)

1937 **621 .392 (.944) & 625 .13 (.944)**
Journal, Institution of Engineers, Australia, No. 5, May, p. 173.
KARMALSKY (V.) & LINTON (G. H.). — **Electric welding of steel bridges.** (4 700 words & fig.)

1937 **624 .7**
Journal, Institution of Engineers, Australia, No. 5, May, p. 180.
KNIGHT (A. W.). — **The design and construction of composite slab and girder bridges.** (5 000 words & fig.)

Journal, Permanent Way Institution. (London.)

1937 **625 .111 & 625 .22**
Journal, Permanent Way Institution, April, p. 45.
RUSSEL (H. J.). — Some aspects and problems connected with the **conveyance of exceptional loads.** (16 500 words & fig.)

1937 **351 .812.1 (.42)**
Journal, Permanent Way Institution, April, p. 83.
UNWIN (G.). — The rule book. **A peep into the past.** (6 000 words.)

1937 **621 .13 & 621 .14**
Journal, Permanent Way Institution, April, p. 95.
PEARSON (H. M.). — Relationship between **the Permanent Way and the locomotive.** (1 750 words.)

1937 **625 .111 & 625 .172**
Journal, Permanent Way Institution, April, p. 99.
LEDGER (H.). — **Alignment of railway tracks.** (3 600 words & tables.)

1937 **385 .587 & 625 .17**
Journal, Permanent Way Institution, April, p. 107.
WENSLEY (Fr.). — **Permanent Way workers and maintenance.** (7 500 words.)

1937 **625 .1 (.42) & 656 .28 (.42)**
Journal, Permanent Way Institution, April, p. 124.
Government reports upon **railway** accidents. (9 500 words.)

Journal, Western Society of Engineers. (Chicago.)

1937 **656 .222.1 (.73)**
Journal, Western Society of Engineers, No. 2, April, p. 49.
GURLEY (F. G.). — **High speed passenger trains.** (6 500 words.)

1937 **656 .211 (093 (.73)**
Journal, Western Society of Engineers, No. 2, April, p. 78.
History of Chicago Passenger Stations. (4 000 words.)

London & North Eastern Railway Magazine. (London.)

1937 **621 .132.3 (.42) & 625 .232 (.42)**
London & North Eastern Railway Magazine, No. 8, August, p. 441.
The Coronation. Streamlined trains — London and Edinburgh (3 500 words.)

Mechanical Engineering. (New York.)

1937 **621 .43 (.73)**
Mechanical Engineering, No. 6, June, p. 401.
BUDD (E. G.). — **Automotive engineering applied to railroading.** (3 600 words & fig.)

1937 **621 .392 & 665 .882**
Mechanical Engineering, No. 6, June, p. 409.
CHAPMAN (E.). — **Welded steel in high-speed railroad service.** (3 000 words & fig.)

1937 **621 .93**
Mechanical Engineering, No. 6, June, p. 413.
DEALE (R. C.). — **Effective use of metal-cutting tools.** (2 500 words & fig.)

1937 **621 .82 & 621 .89**
Mechanical Engineering No. 6, June, p. 415.
ALMEN (J. O.). — **Lubricants and false brinelling of ball and roller bearings.** (5 400 words & fig.)

1937 **62. (01**
Mechanical Engineering, No. 6, June, p. 423.
SOLAKIAN (A. G.). — Stress-optically less sensitive materials in **photoelasticity.** (1 700 words & fig.)

1937 **621 .7 & 621 .8**
Mechanical Engineering, No. 6, June, p. 427.
MURRAY (A. F.). — **Economics of manufacturing layout.** (3 400 words & fig.)

1937 **532**
Mechanical Engineering, No. 6, June, p. 437.
PARR (H. L.). — **Fluid-flow analyzer.** A small inexpensive device that is simple to operate. (1 300 words & fig.)

1937 **625 .25 & 656 .222 .1**
Mechanical Engineering, No. 7, July, p. 511.
SILLCOX (L. K.). — **How fast is too slow.** (3 900 words & fig.)

1937 **621 .131.2 (.73)**
Mechanical Engineering, No. 7, July, p. 534.
Steamotive. (4 800 words.)

1937 **621 .335**
Mechanical Engineering, No. 8, August, p. 571.
ANDREWS (H. L.). — **Modern electric units in transportation.** (3 500 words & fig.)

1937 **621 .134.5 & 625 .21**
Mechanical Engineering, No. 8, August, p. 625.
Railway lubricants. (4 200 words.)

Modern Transport. (London.)

1937 **621 .43 (.82**
Modern Transport, No. 951, June 5, p. 3.
Diesel Railcars for local services in Latin Americ (2 300 words & fig.)

1937 **625 .235 (.42**
Modern Transport, No 951, June 5, p. 4.
Finishing of Railway Carriages. (700 words.)

1937 **621 .132.6 (.44) & 656 .222 (.4**
Modern Transport, No. 951, June 5, p. 5.
French suburban train working, No. 3 — Mode steam locomotives. (1 500 words & fig.)

1937 **656 (.8)**
Modern Transport, No. 951, June 5, p. 8.
Transport in Latin America. Rail and road development. (1 200 words.)

1937 **621 .132.8 (.946)**
Modern Transport, No. 952, June 12, p. 3.
Steam railcars for Tasmania. (1 000 words & fig.)

1937 **621 .335 (.73) & 621 .43 (.73)**
Modern Transport, No. 952, June 12, p. 8.
Diesel-electric express locomotives. Baltimore and Ohio units. (1 300 words & fig.)

1937 **625 .164 (.42)**
Modern Transport, No. 952. June 12, p. 8.
An L. M. S. protective structure. Avalanche tunnel. (600 words & fig.)

1937 **385. (061.1**
Modern Transport, No. 953, June 19, p. 2.
Railway Congress in Paris. (1 400 words.)

1937 **621 .338 (.44)**
Modern Transport, No. 953, June 19, p. 3.
All-welded electric trains in France. (1 000 words & fig.)

1937 **621 .33, 656 .222 (.4) & 656 .222.1 (.4)**
Modern Transport, No. 951, June 5, p. 6; No. 952, June 12, p. 7; No. 953, June 19, p. 4; No. 954, June 26, p. 12 and No. 956, July 10, p. 9.
WIENER (L.). — **Continental Railway speeds and services.** (4 800 words & fig.)

1937 **385. (061.1**
Modern Transport, No. 953, June 19, p. 5; No. 954, June 26, p. 13 and No. 955, July 3, p. 7.
International Railway Congress. (15 000 words.)

1937 **385 .1 (.54)**
Modern Transport, No. 953. June 19, p. 9.
Transport in Ceylan. (2 500 words.)

1937 **656. (.43)**
Modern Transport, No. 954, June 26, p. 2.
Rail and road in Germany. (1 200 words.)

1937 **656. (.43)**
Modern Transport, No. 954, June 26, p. 3.
Transport in Germany. Measures adopted for division of traffic between rail and road. (2 200 words.)

1937 **621 .33 (.43)**
Modern Transport, No. 954, June 26, p. 4.
Railway electrification in Germany. (1 200 words.)

1937 **621 .33 (.42)**
Modern Transport, No. 954, June 26, p. 5.
Electric trains to Portsmouth and Alton. (3 000 words and fig.)

1937 **621 .43 (.43) & 625 .1 (.43)**
Modern Transport, No. 954, June 26, p. 8.
High-speed rail travel in Germany. Fitting the track to the train. (1 000 words & fig.)

1937 **625 .4 (.43)**
Modern Transport, No. 954, June 26, p. 9.
Underground Railways of Berlin. (4 800 words & fig.)

1937 **625 .23 (.43)**
Modern Transport, No. 954, June 26, p. 16.
German double-deck steam train unit. (1 000 words & fig.)

1937 **621 .132.3 (.42)**
Modern Transport, No. 954, June 26, p. 17.
Streamlining of German steam-hauled trains. (3 000 words & fig.)

1937 **625 .3 (.43)**
Modern Transport, No. 954, June 26, p. 35.
The Bavarian Zugspitze Railway. (2 200 words & fig.)

1937 **621 .33 (.45)**
Modern Transport, No. 954, June 26, p. 36.
Electric trains in Italy. Phenomenal acceleration. (400 words & one map.)

1937 **621 .338 (.42)**
Modern Transport, No. 955, July 3, p. 3.
S. R. Electric trains to Portsmouth. Details of rolling stock. (2 900 words & fig.)

1937 **621 .132.3 (.42), 625 .232 (.42) & 656 .222.1 (.42)**
Modern Transport, No. 955, July 3, p. 5.
High speed anglo-scottish train services L. N. E. R. streamlined rolling-stock and Z. M. S. R. record run. (2 300 words & fig.)

1937 **313 : 658 .28 (.42)**
Modern Transport, No. 955, July 3, p. 6.
Railway accidents in Great Britain. High standard of safety maintained. (2 000 words.)

1937 **621 .43 (.42)**
Modern Transport, No. 956, July 10, p. 3.
Diesel-mechanical railcar development. (2 400 words & fig.)

1937 **656 .222.1 (.42)**
Modern Transport, No. 956, July 10, p. 4.
Accelerated London-Glasgow train service. The L. M. S. « Coronation scot. » (1 500 words & fig.)

1937 **625 .232 (.42) & 656 .222.1 (.42)**
Modern Transport, No. 956, July 10, p. 5.
« Coronation » expresses on L. N. E. R. London-Edinburgh in six hours. (1 500 words & fig.)

1937 **621 .132.6 (.43)**
Modern Transport, No. 956, July 10, p. 6.
Tank locomotives for branch service. (800 words & fig.)

1937 **625 .232 (.494)**
Modern Transport, No. 957, July 17, p. 3.
All-steel rolling stock for Switzerland. (1 800 words & fig.)

1937 **621 .138.5**
Modern Transport, No. 957, July 17, p. 5.
Locomotive weighing machines. (1 000 words & fig.)

1937 **656 .211 (093 (.42)**
Modern Transport, No. 957, July 17, p. 7.
1837 — **Euston** : from Queen Victoria to George VI. — 1937 : **Centenary of a famous London railway station.** (1 700 words & fig.)

1937 **656 .211.5 (.43) & 656 .254 (.43)**
Modern Transport, No. 958, July 24, p. 3.
Wireless equipment for station announcements. Loudspeaker installations on the Reichsbahn. (1 800 words & fig.)

1937 **656 .211.5 (.42)**
Modern Transport, No. 958, July 24, p. 4.
Photocells in tube railway service. (900 words & fig.

1937 **385 (.51)**
Modern Transport, No. 958, July 24, p. 5.
CANTLIE (K.). — **Rehabilitation of Chinese Railways.** (2 700 words.)

1937 **621 .335 (.68)**
Modern Transport, No. 958, July 24, p. 7.
Electric locomotives for South Africa. Additional Metrovick units, for Natal Section. (1 100 words & fig.)

1937 **66 & 656 .2**
Modern Transport, No. 958, July 24, p. 8.
BASSETT (H. N.). — **The chemist and modern transport.** (1 800 words.)

1937 **625 .234 (.42)**
Modern Transport, No. 959, July 31, p. 4.
STRAUSS (F.). — **Heating of railway carriages.** (1 500 words & fig.)

1937 **347 .763 & 656 .1**
Modern Transport, No. 959, July 31, p. 5.
Legislative restrictions on road transport. (2700 words.) (*To be continued.*)

1937 **625 .215 (.44) & 625 .23 (.44)**
Modern Transport, No. 959, July 31, p. 7.
Railway rolling stock in France. New standards recommended. (1 000 words & fig.)

Proceedings, American Society of Civil Engineers. (New York.)

1937 **55 & 721**
Proc., Americ. Soc. of Civil Engineers, June, p. 1035.
HOGENTOGLER (C. A.) and WILLIS (E. A.). — Essential considerations in the **stabilization of soil.** (6 400 words & fig.)

1937 **55 & 721**
Proc., Americ. Soc. of Civil Engineers, June, p. 1057.
MILLER (R. M.). **Soil reactions** in relation to foundations on piles. (9 000 words, tables & fig.)

1937 **721 .1**
Proc., Americ. Soc. of Civil Engineers, June, p. 1098.
Graphical distribution of **vertical pressure beneath foundations.** (4 000 words & fig.)

1937 **625 .144.1**
Proc., Americ. Soc. of Civil Engineers, June, p. .
A new theory of rail expansion. (1 200 words & fig.)

1937 **624. (0**
Proc., Americ. Soc. of Civil Engineers, June, p. .
Economics of highway-bridge floorings of various unit weights. (2 500 words.)

1937 **669 & 721 .9**
Proc., Americ. Soc. of Civil Engineers, June, p. .
Structural application of steel and light weight alloys. A symposium. (5 700 words.)

Proceedings, Institution of Railway Signal Engineers. (Reading.)

1937 **656 .25 (.41)**
Proceedings, Institut. of Ry. Signal Engineers, Part II. October, 1936 to January, 1937, p. 200.
GUTHRIE (H. J.). — **Signalling developments** in the Irish Free State. (9 000 words.)

1937 **656 .254**
Proceedings, Institut. of Ry. Signal Engineers, Part II. October, 1936 to January, 1937, p. 223.
GREEN (W. E.). — **How telephones help to work railways.** (11 000 words.)

1937 **656 .253 (.093), 656 .258 (.093) & 656 .259 (.093)**
Proceedings, Institut. of Ry. Signal Engineers, Part II. — October, 1936 to January, 1937, p. 252.
GRIFFITHS (R. S.). — A chronological record of the **protection of facing points.** (8 000 words.)

1937 **656 .251**
Proceedings, Institut. of Ry. Signal Engineers, Part II. — October, 1936 to January, 1937, p. 273.
BIRCHENHOUGH (H.) and WRIGHT (J.). — The design of **signal structures.** (16 000 words.)

Railway Age. (New York.)

1937 **621 .138.1 (.73)**
Railway Age, No. 23, June 5, p. 935.
Southern Pacific overhauls New Orleans terminals. (2 400 words & fig.)

1937 **656 .254 (.73)**
Railway Age, No. 23, June 5, p. 938.
Centralized traffic control on the Missouri Pacific. (2 500 words & fig.)

1937 **625 .143.2 (.73), 625 .246 (.73) & 669 .1 (.73)**
Railway Age, No. 23, June 5, p. 944.
New-York Railroad Club has « **U. S. steel night** ». (3 000 words & fig.)

1937 **625 .243 (.73) & 625 .246 (.73)**
Railway Age, No. 24, June 12, p. 969.
Pullman-Standard builds **light but strong box cars.** (1 700 words & fig.)

1937 **621 .133.3 (.73)**
Railway Age, No. 24, June 12, p. 971.
New principle of boiler circulation demonstrated. (1 000 words & fig.)

1937 **656 .237 (06 (.73)**
Railway Age, No. 24, June 12, p. 973.
Accountants hold convention. (8 000 words.)

1937 **625 .143.2 (.73) & 625 .143.3 (.73)**
Railway Age, No. 24, June 12, p. 980.
MOORE (H. F.). — **More about rail failures.** (3 400 words & fig.)

1937 **625 .1 (.73)**
Railway Age, No. 25, June 19, p. 1008.
Norfolk & Western opens new coal fields in Virginia. (2 500 words & fig.)

1937 **625 .244 (.73)**
Railway Age, No. 25, June 19, p. 1012.
Milwaukee **refrigerator** car for general service.

1937 **621 .132.3 (.73) & 621 .132.5 (.73)**
Railway Age, No. 25, June 19, p. 1013.
R. F. & P. 4-8-4 type freight and passenger locomotives. (1 000 words & fig.)

1937 **656 .237.4 (.73)**
Railway Age, No. 25, June 19, p. 1023.
SEAY (T. H.). — **Interline freight accounting.** (5 000 words & fig.)

1937 **656 .211 (.73) & 725 .31 (.73)**
Railway Age, No. 26, June 26, p. 1044.
Pennsylvania completes station at Newark, N. Y. (4 000 words & fig.)

1937 **621 .43 (.42)**
Railway Age, No. 26, June 26, p. 1055.
Diesel-electric switchers for the L. M. S. (1 500 words & fig.)

1937 **656 .212.5 & 656 .223.2**
Railway Age, No. 26, June 26, p. 1057.
Getting cars through terminals. The functions of a superintendent in supervising and accelerating yard movements. (2 500 words & fig.)

1937 **656 .261 (.73)**
Railway Age, No. 26, June 26, p. 1060.
Fast service brings business. Louisiana & Arkansas provides early first-morning delivery with trucks and regains traffic. (1 000 words & fig.)

1937 **656 .1 (.73)**
Railway Age, No. 26, June 26, p. 1062.
Superintendents consider **motor transport.** (2 400 words.)

1937 **656 .1 (.73)**
Railway Age, No. 26, June 26, p. 1064.
SMITH (C. E.). — **Motor transport purchasing on the New-Haven.** (2 000 words.)

1937 **621 .43 (.73)**
Railway Age, No. 1, July 3, p. 3.
Birmingham Southern Diesel Transfer locomotives. (2 300 words & fig.)

1937 **625 .111 (.73)**
Railway Age, No. 1, July 3, p. 6.
New York Central depresses **freight line through New York City.** (4 200 words & fig.)

1937 **621 .133.1 (.73) & 656 .2 (06 (.73)**
Railway Age, No. 1, July 3, p. 17.
The superintendent and **fuel conservation.** (3 000 words.)

1937 **625 .151 (.73) & 656 .257 (.73)**
Railway Age, No. 2, July 10, p. 37.
Seaboard utilizes spring switches. (3 000 words & fig.)

1937 **62. (01 (06 (.73)**
Railway Age, No. 2, July 10, p. 39.
Materials in the spotlight. (2 000 words & fig.)

1937 **385 .114 & 621 .138**
Railway Age, No. 2, July 10, p. 41.
MACKEN (J. R.). — **Economic life of a locomotive.** (1 400 words & fig.)

1937 **621 .13 (0 (.73) & 656 .222 (.73)**
Railway Age, No. 2, July 10, p. 44.
Increasing locomotive mileage by short runs. (1 300 words & fig.)

1937 **385 .1 (.73)**
Railway Age, No. 3, July 17, p. 63.
How much recovery has there been ? (2 200 words & tables.)

1937 **62. (01, 624. (0 & 691**
Railway Age, No. 3, July 17, p. 66.
SNADER (D. L.). — **How permanent is concrete ?** (3 200 words & fig.)

1937 **656 .27 (.73)**
Railway Age, No. 3, July 17, p. 71.
Operating local passenger trains. (1 900 words.)

1937 **656 .221**
Railway Age, No. 3, July 17, p. 75.
TOTTEN (A. I.). — **Resistance of lightweight passenger trains.** (4 300 words.)

1937 **624 .1**
Railway Age, No. 4, July 24, p. 96.
Draw-span protection embodies novel features of design. (1 000 words & fig.)

1937 **385. (064 (.73)**
Railway Age, No. 4, July 24, p. 98.
Railroad participation in world's fair. (400 words.)

1937 **621 .132.3 (.42) & 625 .232 (.42)**
Railway Age, No. 4, July 24, p. 103.
London & North Eastern inaugurates « **Coronation** » **trains.** (900 words & fig.)

1937 **656 .73**
Railway Age, No. 4, July 24, p. 106.
National Resources Committee reports on transport. (2 300 words.)

1937 **656 .1 (.73)**
Railway Age, No. 4, July 24, p. 108.
Says motor drivers can stand 60-hr. week. (1 600 words.)

1937 **656 .233 (.73)**
Railway Age, No. 4, July 24, p. 109.
North-South divisions plan proposed. (1 900 words.)

1937 **656 .1 (.73)**
Railway Age, No. 4, July 24, p. 112.
Eliminating empty truck miles. (1 400 words & fig.)

Railway Engineering and Maintenance. (Chicago.)

1937 **625 .14 (.73) & 656 .222.1 (.73)**
Railway Engineering and Maintenance, July, p. 470.
FARIES (R.). — **High-speed service demands higher track standards.** (2 800 words & fig.)

1937 **621 .392**
Railway Engineering and Maintenance, July, p. 475.
Good practice in **structural welding.** (3 000 words & fig.)

1937 **625 .26 (.73) & 698. (.73)**
Railway Engineering and Maintenance, July, p. 477.
BURPEE (C. M.). — How many **paint brushes ?** D & H. reduces 200 types to 47. (2 300 words & fig.)

1937 **625 .144.4 (.73)**
Railway Engineering and Maintenance, July, p. 481.
« Sledding ». The latest in **long rail transportation.** (2 100 words & fig.)

1937 **625 .143.4 (.73)**
Railway Engineering and Maintenance, July, p. 484.
Fighting corrosion at rail joints. (1 600 words & fig.)

1937 **624. (.73) & 625 .171 (.73)**
Railway Engineering and Maintenance, July, p. 486.
ROBINSON (G. E.). — **Inspecting substructures.** (1 200 words.)

Railway Gazette. (London.)

1937 **621 .132.1 (.42)**
Railway Gazette, No. 23, June 4, p. 1068 and No. 24, June 11, p. 1110.
British Locomotive types, No. XIV and XV, **Southern Railway.** (12 figures.)

1937 **385. (09**
Railway Gazette, No. 23, June 4, p. 1071; No. 24, June 1[illegible] p. 1107, and No. 26, June 25, p. 1200.
LEE (Ch. E.). — **The evolution of railways.** (8 00 words & fig.)

1937 **625 .11 (.55**
Railway Gazette, No. 24, June 11, p. 1112.
The trans-Iranian (Persian) Railway. (600 words fig.)

1937 **656 (.54**
Railway Gazette, No. 24, June 11, p. 1113.
Hammond report on the transport system of Ceylo (Although recommending the closing of certain sectio of line, the Commission proves conclusively that th railway must be retained, but considers it should n itself run road or air services.) (4 000 words.)

1937 **625 .235 (.42**
Railway Gazette, No. 24, June 11, p. 1117.
A new L. M. S. R. painting process. (900 words fig.)

1937 **656 .257 (.44**
Railway Gazette, No. 24, June 11, p. 1118.
Long distance signal and point operation. (1 900 wor & fig.)

1937 **621 .94 (.42) & 625 .212 (.42**
Railway Gazette, No. 24, June 11, p. 1121.
Regrinding axle journals. (300 words & fig.)

1937 **38**
Railway Gazette, No. 24, June 11, p. 1126.
The International Railway Congress in Paris. (4 5 words.)

1937 **385. (09 (.4**
Railway Gazette, No. 25, June 18, p. 1159.
The Railways of Germany. (4 500 words & fig.)

1937 **656 .28 (01 (.4**
Railway Gazette, No. 26, June 25, p. 1192.
Colonel Mount's Annual Report (Railway accident (2 500 words.)

1937 **621 .133.7 (.4**
Railway Gazette, No. 26, June 25, p. 1202.
Feed water heaters for steam locomotives. (2 words & fig.)

1937 **621 .132.3 (.5**
Railway Gazette, No. 26, June 25, p. 1205.
New 4-6-2 type express locomotives for India. (1 words & fig.)

1937 **625 .232 (.49**
Railway Gazette, No. 26, June 25, p. 1208.
New lightweight metal coaches, Swiss Federal R ways. (300 words.)

1937 **385 .1 (.**
Railway Gazette, No. 1, July 2, p. 10.
Indian Railway enquiry. (5 800 words.)

1937 **656 .1 (.42)**
ilway Gazette, No. 1, July 2, p. 17.
BEVERIDGE (R.). — **The Scottish Motor traction oup.** (Some details of the development of the original M. T. and the evolution of the present group in con- nction with the L. M. S. R. and L. N. E. R.) (3 500 ords & fig.)

1937 **656 .1 (.42)**
ilway Gazette, No. 1, July 2, p. 25.
MacBrayne and the West Highlands. (The extensive ad activities of a famous railway-associated shipping mpany.) (1 600 words & fig.)

1937 **621 .132.3 (.42) & 625 .232 (.42)**
ilway Gazette, No. 1, July 2, p. 31.
The Coronation express, L. N. E. R. (2 000 words & .)

1937 **625 .232 (.51)**
ilway Gazette, No. 2, July 9, p. 59.
Belgian-built all-steel rolling stock, for the Lung- i Railway, China. (500 words.)

1937 **621 .132.1 (.42)**
ilway Gazette, No. 2, July 9, p. 60.
British locomotive type — XVI Southern Railway. (8 ures.)

1937 **656 .222.4 (.945)**
ilway Gazette, No. 2, July 9, p. 64.
Train control and timetable graphs, Victorian Rail- ys. (800 words.)

1937 **625 .144.4 (.42) & 625 .172 (.42)**
ilway Gazette, No. 2, July 9, p. 65.
Measured shovel packing, L. M. S. R. (1 500 words & .)

1937 **656 .222.1 (.42)**
ilway Gazette, No. 2, July 9, p. 76.
Inaugural journeys of **streamlined L. N. E. R. Corona- n and L. M. S. R. Coronation Scot Trains.** (1 800 rds & fig.)

1937 **656 .281 (.42)**
ilway Gazette, No. 2, July 9, p. 78.
Ministry of Transport accident report. Derailment of h van at Barford, L. N. E. R. : March 18. 1937 (2 900 rds.)

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937 **625 .215 (.494)**
ilway Gazette, No. 3, July 16, p. 111.
New bogies for coaches of the Swiss Federal Railways. 0 words & fig.)

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937 **385. (092**
ilway Gazette, No. 3, July 16, p. 113.
Gooch's application for employment. (2 000 words fig.)

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937 **625 .144.4 (.42)**
ilway Gazette, No. 3, July 16, p. 115.
Long welded rails on the Southern Railway. (1 600 rds & fig.)

1937 **385. (071.3 (.54)**
Railway Gazette, No. 3, July 16, p. 118.
Walton training school, India. (5 figures.)

1937 **621 .392 (.54) & 625 .13 (.54)**
Railway Gazette, No. 3, July 16, p. 120.
Bridge welding in India. (2 000 words & fig.)

1937 **385 .1 (.54)**
Railway Gazette, No. 4, July 23, p. 140.
The Wedgwood report on Indian State Railways (2 100 words.)

1937 **656 .21 (093 (.42)**
Railway Gazette, No. 4, July 23, p. 147.
The Centenary of Euston. (1 000 words & fig.)

1937 **621 .132.3 (.438)**
Railway Gazette, No. 4, July 23, p. 148.
New 4-6-2 type streamlined locomotives, Polish State Railways. (700 words.)

1937 **621 .8, 656 .212.6 (.42)**
Railway Gazette, No. 4, July 23, p. 149.
DALZIEL (B. J.). — **The design and operation of capstans** — I. (1 700 words.) (*To be continued.*)

1937 **625 .234**
Railway Gazette, No. 4, July 23. p. 150.
Some aspects of air conditioning. (1 200 words.)

1937 **625 .172 (.42)**
Railway Gazette, No. 4, July 23, p. 152.
New weed-killing train, Southern Railway. (1 200 words & fig.)

1937 **625 .245 (.42)**
Railway Gazette. No. 4, July 23, p. 155.
G. W. R. **vehicles for exceptional loads** — VI. (Fig.).

1937 **385. (064 (.44)**
Railway Gazette, No. 4, July 23, p. 161.
Railways at the Paris International Exhibition, 1937. (1 200 words.)

1937 **656 .222.1**
Railway Gazette, No. 5, July 30, p. 185.
Rail speed consciousness. (900 words.)

1937 **656 .234**
Railway Gazette, No. 5, July 30, p. 191.
The work of Cooke and Wheatstone. (Centenary of the first use of the electric telegraph on a railway in England.) (1 500 words.)

1937 **347 .763 (.42)**
Railway Gazette, No. 5, July 30. p. 196.
Second annual reports of the Traffic Area Licensing Authorities. (900 words.)

1937 **385. (071.3 (.42)**
Railway Gazette, No. 5, July 30. p. 197.
Intensive L. M. S. R. training of motor drivers. (1 300 words & fig.)

1937 **621 .43 (.71), 656 .1 (.71) & 656 .2 (.71)**
Railway Gazette, No. 5, July 30, p. 204.
Road-rail vehicles in Canada. (400 words & fig.)

1937 **621 .132.5 (.51)**
Railway Gazette, No. 5, July 30, p. 205.
New 2-10-2 type locomotive, Tientsin-Pukow Railway. (900 words & fig.)

1937 **621 .43 (.42)**
Diesel Railway Traction, suppl. to the Railway Gazette, June 11, p. 1142.
Diesel-mechanical locomotive for industrial shunting. (600 words & fig.)

1937 **621 .43 (.82)**
Diesel Railway Traction, suppl. to the Railway Gazette, June 11, p. 1144.
Broad-gauge one-class railcars for Argentina. (3 000 words & fig.)

1937 **621 .43 & 621 .8**
Diesel Railway Traction, suppl. to the Railway Gazette, July 9, p. 86.
Another Mylius gearbox development. (1 500 words & fig.)

1937 **621 .43 (.42)**
Diesel Railway Traction, suppl. to the Railway Gazette, July 9, p. 90.
A new British railcar. (3 500 words & fig.)

1937 **621 .335 (.41) & 621 .43 (.41)**
Diesel Railway Traction, suppl. to the Railway Gazette, July 9, p. 96.
Broad-gauge double-bogie locomotive for Ireland. (300 words & fig.)

1937 **621 .335 (.73) & 621 .43 (.43)**
Diesel Railway Traction, suppl. to the Railway Gazette, July 9, p. 97.
Another giant for the U. S. A. (1 400 words & fig.)

1937 **621 .43 (.68)**
Diesel Railway Traction, suppl. to the Railway Gazette, July 9, p. 99.
Shunting locomotive for Africa. (500 words & fig.)

1937 **621 .43 (.495)**
Diesel Railway Traction, suppl. to the Railway Gazette, July 9, p. 100.
First Diesel Cars in Greece. (400 words & fig.)

1937 **621 .33 (.42)**
Diesel Railway Traction, suppl. to the Railway Gazette, June 25, p. 1225.
The London-Portsmouth electrification, Southern Railway. Power supply and distribution. Signalling arrangements. Civil engineering. Traffic operation. Rolling stock. (10 000 words, maps & fig.)

1937 **621 .335 (.68)**
Electric Railway Traction, p. 174, supplt. to the Railway Gazette, July 23.
New locomotives for South Africa. (1 500 words & fig.)

1937 **621 .335 (.45) & 621 .338 (.45**
Electric Railway Traction, p. 177, supplt. to the Railway Gazette, July 23.
High-speed trains in Italy. (1 300 words & fig.) (To be continued.)

Railway Magazine. (London.)

1937 **385 .1 (.73**
Railway Magazine, No. 480, June, p. 398.
COLLONS (R. E.). — **Railway practice in the U. S. A.** (3 100 words.)

1937 **656 .222.1 (.42**
Railway Magazine, No. 480, June, p. 404, and No. 48 July, p. 10.
ALLEN (C. J.). — **British locomotive practice and performance.** (8 000 words & fig.)

1937 **625 .232 (.4**
Railway Magazine, No. 480, June, p. 417.
ELLIS (C. H.). — **Royal trains.** (2 500 words & fig

1937 **656 .222.1 (.71 + .7**
Railway Magazine, No. 481, July, p. 18.
MERCURY. — **North American Railway speeds** 1936. (1 400 words & tables.)

1937 **621 .138.1 (.4**
Railway Magazine, No. 481, July, p. 23.
Reorganisation of L. M. S. R. **locomotive depo** (1 500 words & fig.)

1937 **385. (09 (.4**
Railway Magazine, No. 481, July, p. 29.
PEARSON (H. M.). — **The Cambrian coast.** (3 words & fig.)

1937 **621 .132.3 (.42) & 625 .232 (.4**
Railway Magazine, No. 481, July, p. 39.
The Coronation Scot, L. M. S. R. (1 200 words & f

1937 **656 .211 (09 (.4**
Railway Magazine, No. 481, July, p. 43.
BARRIE (D. S.). — **The story of Euston.** (4 words & fig.)

Railway Mechanical Engineer. (New York.)

1937 **385. (**
Railway Mechanical Engineer, No. 6, June, p. 247.
The new era of **Railway progress.** (1 500 w & fig.)

1937 **625 .26 (**
Railway Mechanical Engineer, No. 6, June, p. 272.
With the car foremen and inspectors. (3 200 w & fig.)

1937 **621 .138.5 (**
Railway Mechanical Engineer, No. 6, June, p. 282.
Combination lifter for locomotive parts. (500 w & fig.)

1937 **625 .232 (.73)**
ailway Mechanical Engineer, No. 7, July, p. 303.
Lightweight cars for the Santa Fé « Super Chief ». 2 800 words & fig.)

1937 **621 .132.3 (.73) & 621 .132.5 (.73)**
ailway Mechanical Engineer, No. 7, July, p. 308.
High tractive force and large tanks feature R. F. P. 4-8-4 locomotives. (1 500 words & fig.)

1937 **385 .586 (.945)**
ailway Mechanical Engineer, No. 7, July, p. 310.
CAMERON (D.). — **How Victorian State Railways ain apprentices.** (1 300 words.)

1937 **625 .214**
ailway Mechanical Engineer, No. 7, July, p. 311.
CALLAHAN (J. J.). — Essentials of **journal-packing** pecifications. (2 600 words.)

1937 **625 .244 (.73)**
ailway Mechanical Engineer, No. 7, July, p. 313.
Insulated building for testing **refrigerator cars.** 1 000 words.)

1937 **621 .392 (.73)**
ailway Mechanical Engineer, No. 7, July, p. 319.
Safe ending flues improved by air blast. (700 words fig.)

1937 **621 .39 & 625 .26**
ailway Mechanical Engineer, No. 7, July, p. 320.
Electric furnace used in Sedalia **spring shop.** (1 500 ords & fig.)

1937 **621 .138.3 (.73)**
ailway Mechanical Engineer, No. 7, July, p. 322.
GRAY (H. L.). — Typical engineered **cleaning opera-ons.** (1 800 words & fig.)

1937 **625 .245 (.73)**
ailway Mechanical Engineer, No. 7, July, p. 327.
Milwaukee welded automobile cars. (1 700 words fig.)

1937 **385. (071 (.73) & 625 .234 (.73)**
ailway Mechanical Engineer, No. 7, July, p. 330.
Air-conditioning instruction car. (1 000 words & fig.)

Railway Signaling. (Chicago.)

1937 **656 .254 (.73)**
ailway Signaling, June, p. 331.
The Missouri Pacific installs C. T. C. on 34 miles. 2 000 words & fig.)

1937 **621 .39 (.73) & 656 .253 (.73)**
poor en Tramwegen, N° 13, 22 Juni, p. 277.
JENSEN (O. M.). — **Primary battery with rectifiers.** 2 200 words, tables & fig.)

1937 **625 .162 (.73) & 656 .259 (.73)**
Railway Signaling, June, p. 340.
Automatic gates and signals protect crossing on the L. & N. (1 800 words & fig.)

1937 **625 .162 (.73) & 656 .259 (.73)**
Railway Signaling, June, p. 343.
BARTON (G. W.). — **Modernizing crossing protection** with new safety features. (2 300 words & fig.)

1937 **656 .258 (.73)**
Railway Signaling, June, p. 345.
Automatic interlockings on the Frisco. (1 700 words & fig.)

1937 **621 .39 (.73) & 656 .25 (.73)**
Railway Signaling, June, p. 348.
MOORE (A. D.). — **Relay contact test.** (700 words & fig.)

1937 **656 .254 (.73)**
Railway Signaling, July, p. 389.
C. T. C. in coaling-station territory. (4 100 words & fig.)

1937 **625 .162 (.73) & 656 .259 (.73)**
Railway Signaling, July, p. 397.
Crossing protection on the Monon. (1 300 words & fig.)

1937 **625 .151 (.73) & 656 .257 (.73)**
Railway Signaling, July, p. 400.
Seaboard utilizes **spring switches.** (4 500 words & fig.)

1937 **656 .257 (.73)**
Railway Signaling, July, p. 405.
Automatic plant replaces mechanical interlocking. (500 words & fig.)

1937 **625 .151 (.73) & 656 .257 (.73)**
Railway Signaling, July, p. 406.
Spring switch at branch line terminus. (1 300 words & fig.)

South African Railways and Harbours Magazine. (Johannesburg.)

1937 **656 .26**
South African Rys. & Harbours Magazine, June, p. 711.
Where every day is washing day. (Cleaning and laundering plant, S. A. R. H.). (1 800 words & fig.)

1937 **625 .143.4 (.68) & 665 .882 (.68)**
South African Rys. & Harbours Magazine, June, p. 771.
Notes from the chief Civil Engineer's Department S. A. R. & H. **(Thermit welding of rails.)** (2 000 words & fig.)

The Locomotive. (London.)

1937 **385. (06 (.111)**
The Locomotive, No. 539, July 15, p. 201.
The International Railway Congress. (1 000 words.)

1937 **656 .222.1 (.42)**
The Locomotive, No. 539, July 15, p. 202.
Record trial run of the « Coronation Scot » train, L. M. & S. R. (600 words & fig.)

1937 **621 .132.3 (.42) & 625 .232 (.42)**
The Locomotive, No. 539, July 15, p. 203.
New « Coronation » trains : L. & N. E. Railway. (3 400 words & fig.)

1937 **621 .132.3 (.42) & 621 .132.5 (.42)**
The Locomotive, No. 539, July 15, p. 208.
4-6-0 mixed traffic locomotives, L. M. & S. R. (400 words.)

1937 **621 .13 (0 (.42)**
The Locomotive, No. 539, July 15, p. 209.
Merger of two famous locomotive firms. (2 800 words.)

1937 **621 .132.3 (.42)**
The Locomotive, No. 539, July 15, p. 211.
4-6-0 streamlined locomotive French State Railways. (400 words & fig.)

1937 **621 .131.2 (.42)**
The Locomotive, No. 539, July 15, p. 212.
Locomotive centres of gravity. (200 words.)

1937 **621 .33 (.42)**
The Locomotive, No. 539, July 15, p. 214.
London and Portsmouth electrification, Southern Railway. (1 700 words.)

1937 **621 .132.3 (.42)**
The Locomotive, No. 539, July 15, p. 216.
« Pacific » type locomotives, G. I. P. Railway. (500 words & fig.)

1937 **621 .132.3 (.44)**
The Locomotive, No. 539, July 15, p. 219.
New « Baltic » type locomotives, Northern Railway of France. (1 400 words & fig.)

1937 **621 .43 (.67)**
The Locomotive, No. 539, July 15, p. 221.
Railcar for the Rhodesia Rys. (600 words & fig.)

1937 **385. (09 (.492)**
The Locomotive, No. 539, July 15, p. 222.
DERENS (L.). — **The Dutch State Railways Company.** (2 100 words & fig.) **(To be continued.)**

1937 **621 .43 (.41)**
The Locomotive, No. 539, July 15, p. 225.
Diesel locomotive, Belfast and County Down Railway. (1 000 words & fig.)

1937 **621 .132.1 (.41)**
The Locomotive, No. 539, July 15, p. 226.
REED (K. H.) and FAYLE (H.). — **Recent developments of Irish locomotive practice,** Great Southern Railways. (1 100 words & fig.) (To be continued.)

The Oil Engine. (London.)

1937 **621 .43 (.44)**
The Oil Engine, No. 50, Mid-June, p. 34.
The largest oil-engined locomotive. 4 400 b.h.p. unit to maintain speeds up to 85 m.p.h. on the Paris-Riviera route. (P. L. M.) (1 800 words & fig.)

1937 **621 .43 (.43)**
The Oil Engine, No. 50, Mid-June, p. 38.
A new German Diesel express, (200 words & fig.)

1937 **621 .43 (.42)**
The Oil Engine, No. 51, Mid-July, p. 66.
The manufacture of British Diesel rolling stock (2 200 words & fig.)

1937 **621 .43 (.4**
The Oil Engine, No. 51, Mid-July, p. 70.
Diesel rail traction on the Continent. (2 300 word & fig.)

1937 **621 .43 & 621**
The Oil Engine, No. 51, Mid-July, p. 76.
Hyde TRUTCH (C. J.). — **Electrical and mechanic transmission for Diesel traction.** (3 000 words.)

1937 **621 .43 & 621**
The Oil Engine, No. 51, Mid-July, p. 77.
Transmission systems for Diesel locomotives and ra cars. (2 200 words & fig.)

1937 **621 .43 (.4**
The Oil Engine, No. 51, Mid-July, p. 81.
A 48-ton mixed-service locomotive. (800 words fig.)

1937 **621 .43 & 6**
The Oil-Engine, No. 51, Mid-July, p. 82.
Fuels for internal-combustion engines. (1 900 wo & fig.)

1937 **621 .43 (.42) & 656 .22 (.4**
The Oil Engine, No. 51, Mid-July, p. 84.
A million miles a year. (1 200 words & fig.)

1937 **621 .43 & 625 .2**
The Oil Engine, No. 51, Mid-July, p. 86.
The heating of Diesel rolling stock. (1 200 words fig.)

1937 **621 .33 & 621**
The Oil Engine, No. 51, Mid-July, p. 88.
MANN (Ch. F.). — **A reply to electrification.** (words & fig.)

1937 621 .43
he Oil Engine, No. 51, Mid-July, p. 90.
Silencers for Diesel engines. (1 600 words & fig.)

1937 621 .43 (.43)
he Oil Engine, No. 51, Mid-July, p. 98.
Trials of a direct-drive Diesel locomotive. (300 words fig.)

1937 621 .43 (.42)
ıe Oil Engine, No. 51, Mid-July, p. 99.
New design of shunting locomotive. (800 words & g.)

1937 621 .43 (.44)
ıe Oil Engine, No. 51, Mid-July, p. 100.
112 m.p.h. aerial-propelled railcar unit. (300 words fig.)

1937 621 .43 (.55)
ıe Oil Engine, No. 51, Mid-July, p. 100.
Railcars for Iran. 800 b.h.p. two-cycle-engined units. 00 words & fig.)

1937 621 .43 (.43)
ıe Oil Engine, No. 51, Mid-July, p. 101.
STROEBE. — **Fast Diesel railcars in Germany.** (2 400 ords.)

Transit Journal. (New York.)

1937 388
ansit Journal, No. 6, June, p. 180.
WOOTON (P.). — **Unification (of transit facilities)** just common sense. (1 700 words & fig.)

1937 656 .254 (.71)
ansit Journal, No. 6, June, p. 183.
Toronto relays radio flashes. (Fast switchboard ser- e tells street inspectors, operating divisions, news of idents and fires received in police calls.) (500 words fig.)

1937 385 .113 (.73)
ansit Journal, No. 6, June, p. 187.
BUCK (M.). — **Transit net income up for 1936.** 00 words and tables.)

1937 621 .336
ansit Journal, No. 7, July, p. 252.
SCOTT (A. G.). — **Trolley wire life increased.** (800 rds.)

1937 625 .214 & 625 .26
ansit Journal, No. 7, July, p. 256.
CUSHING (T. E.). — Case of **spherical journal bear-** rs. (500 words & fig.)

In Bulgarian.
(= 91.881)

Spisanie. (Sofia.)

1936 625 .244 = 91 .881
Spisanie, September, p. 225.
ANDREJEV. — Transport in **refrigerator wagons.**

1936 656 .1 (.437) = 91 .881
Spisanie, September, p. 234.
Road motor services worked by the Czechoslovak State Railways. (3 000 words.)

1936 625 .214 (.497 .2) = 91 .881
Spisanie, September, p. 243.
PRVANOV. — **Hot boxes on goods wagons** of the Bulgarian State Railways. (3 000 words & diagr.)

In Spanish.

Carreteras. (Buenos Aires.)

1937 624 .2
Carreteras, diciembre, p. 207.
Determinación de los coeficientes de fricción de apoyos móviles para **puentes.** (10 000 palabras, 8 cuadros & fig.)

In Italian.

Annali dei lavori pubblici. (Roma.)

1937 621 .392 & 624 .62
Annali dei lavori pubblici, guigno, p. 482.
MASI (F.). — Nuovo **ponte** di acciaio saldato sul torrente Mallero a Sondrio. (2 300 parole & fig.)

La tecnica professionale. (Firenze.)

1937 621 .135.1
La tecnica professionale, maggio, p. 102.
FLORES (E.). — La verifica dei **telai delle locomotive.** (3 600 parole & fig.)

1937 621 .134.1
La tecnica professionale, luglio, p. 151.
DIEGOLI. — I **cuscinetti delle bielle** nelle locomotive veloci. (2 300 parole & fig.)

1937 621 .335 (.45)
La tecnica professionale, agosto, p. 178.
RISSONE (S.). — Rimessa e cavalletti di rialzo per **elettrotreni.** (800 parole & fig.)

L'Ingegnere. (Roma.)

1937 **624 .2**
L'Ingegnere, luglio, p. 307.
HOFFMAN (O.). — Sul calcolo dei **ponti** a travi rettilinee **in cemento armato.** (2 500 parole & fig.)

Rivista tecnica delle ferrovie italiane. (Roma.)

1937 **385. (09 (.63)**
Rivista tecnica delle ferrovie ital., 15 giugno, p. 337.
TONETTI (C.). — La **futura rete ferroviaria dell' Impero** nel quadro del piano regolatore delle ferrovie africane. (15 000 parole & tavole.)

1937 **621 .43 (.45)**
Rivista tecnica delle ferrovie ital., 15 giugno, p. 367.
CUTTICA (A.). — Le **automotrici** delle Ferrovie dello Stato. (6 000 parole & fig.)

In Dutch.

De Ingenieur. (Den Haag.)

1937 **625 .13**
De Ingenieur, No. 27, 2 Juli, p. A. 247.
Tunnelventilatie. Rapport der Tunnelventilatiecommissie van het Koninklijk Institut van ingenieurs. (5 400 woorden.)

1937 **624 (.493 + .92)**
De Ingenieur, No. 28, 9 Juli, p. B. 107.
KIST (N. C.). — Het eigen gewicht van Nederlandsche en Indische **bruggen.** (1 600 woorden & tafereelen.)

1937 **62. (01 & 669**
De Ingenieur, No. 29, 16 Juli, p. MK. 25.
Definities en nomenclatuur bij de beproevingen van **metalen.** (2 300 woorden.)

1937 **656 .21 (.492)**
De Ingenieur, No. 31, 30 Juli, p. V. 45.
ANKERSMIT (L. A. M.). — Wijziging van de spoorweginrichtingen ter verbetering van de **verkeerstoestanden** te Utrecht. (8 000 woorden & fig.)

1937 **624 .51 (.492)**
De Ingenieur, No. 32, 6 Augustus, p. Bt. 47.
EMMEN (J.). — Het **brugontwerp** voor de tweede vaste-oeververbinding over de Nieuwe Maas te Rotterdam. (6 900 woorden & fig.)

Spoor- en Tramwegen. (Utrecht.)

1937 **656. (.492)**
Spoor en Tramwegen, Nr. 13, 22 Juni, p. 277.
De positie der **vervoermiddelen** in het buitenlandsch goederenverkeer. (1 300 woorden.)

1937 **656. (.492)**
Spoor en Tramwegen, Nr. 13, 22 Juni, p. 284.
NIEUWENHUIS (J. G. J. C.). — Over de coördinatie van het verkeer, inzonderheid wat betreft het **goederenvervoer.** (3 500 woorden & fig.)

1937 **621 .43 (.493)**
Spoor en Tramwegen, Nr. 15, 20 Juli, p. 323.
HEYLIGERS (F. J.). — De **electrische arbeidsoverdracht** bij de Nederlandsche Dieseltreinen. (2 200 woorden & fig.)

1937 **625 .11**
Spoor en Tramwegen, Nr. 15, 20 Juli, p. 339.
VISSER (G. F.). — Het **uitzetten van spoorwegen** in ingravingen. (800 woorden & fig.)

1937 **625 .232 (.492)**
Spoor en Tramwegen, Nr. 16, 3 Augustus, p. 356.
Doorgangsrijtuigen 3ᵉ klasse Nrs. 7211-7222 der Nederlandsche Spoorwegen. (700 woorden & fig.)

1937 **656 .211.7 (+ .42 + .44)**
Spoor en Tramwegen, Nr. 16, 3 Augustus, p. 358; Nr. 17, 17 Augustus, p. 382.
De **treinferrydienst** Dover-Duinkerken. (3 000 woorden & fig.)

1937 **621 .131.2**
Spoor en TGramwegen, Ni. 17, 17 Augustus, p. 371; Nr. 18, 31 Augustus, p. 396.
TABERNAL (H. F.). — De stroomlijn in het **railverkeer.** (3 800 woorden & fig.)

1937 **385. (09 (.439)**
Spoor en Tramwegen, Nr. 17, 17 Augustus, p. 374.
ALEX. — Ontstaan, ontwikkeling en inkorting de Kon. Hongaarsche Staatspoorwegen. (1 500 woorden & fig.)

1937 **385 .3 (.492)**
Spoor en Tramwegen, Nr. 17, 17 Augustus, p. 380; Nr. 18, 31 Augustus, p. 399.
VAN DER VEGT (H. W.). — Overzicht van de geschiedenis van den dienst van het **rijkstoezicht** op de spoorwegen. (3 200 woorden & fig.)

1937 **621 .33 (.42**
Spoor en Tramwegen, Nr. 18, 31 Augustus, p. 393.
CUPERUS (J. L. A.). — **Electrificatie** van hoofdspoorwegen in Nederland. (1 900 woorden & fig.)

1937 **625 .6**
Spoor en Tramwegen, Nr. 18, 31 Augustus, p. 404.
STIGTER (L.). — Onrustige gang van **tramrijtuigen** (1 900 woorden & fig.)

In Polish.

(= 91.885)

Inżynier Kolejowy. (Warszawa.)

1936 **624 .32 (.438) = 91 .885**

Inzynier Kolejowy, No. 11, p. 388.

SZELAGOWSKI. — **First welded railway bridge in Poland.** (2 700 words & fig.)

In Portuguese.

Gazeta dos caminhos de ferro. (Lisboa.)

1937 **621 .335 (.45)**

Gazeta dos caminhos de ferro, N° 1192, 16 de agosto, p. 401.

Novo combóio eléctrico italiano. (1 700 palavras & fig.)

Revista das Estradas de ferro. (Rio de Janeiro.)

1937 **621 .33 (.81)**

Revista das Estradas de ferro, 10 de julho, p. 1661.

A electrificação da Estrada de ferro Central do Brasil. (7 600 palavras & fig.)

1937 **385 .1**

Revista das Estradas de ferro, 10 de julho, p. 1687.

A recuperação economica e a crise ferroviaria. (1 600 palavras.)

In Rumanian.

(= 599)

Buletinul societatii politecnice. (Bucuresti.)

1936 **621 .133.1 (.498) = 599**

Buletinul societatii politecnice, July, p. 585.

STRATILESCU. — Comparison of the different railway lines of the Rumanian State as regards fuel consumption on goods trains. (3 000 words.)

Revista tecnica C. F. R. (Bucuresti.)

1936 **625 .113 = 599**

Revista tecnica C. F. R., September-October, p. 261.

MAIOR. — Rectifying railway curves by the Höfer method. (24 000 words, diagram & fig.)

1936 **656 = 599**

Revista tecnica C. F. R., September-October, p. 294.

MICLESCU. — Some suggestions in connection with **road/rail competition.** (6 000 words.)

In Serbian.

(= 91.882)

Saobraćajni Pregled. (Beograd.)

1936 **656 .214 = 91 .882**

Saobracajni Pregled, No. 6, p. 161.

MILER-PETRIC. — **Joint station accountancy** (3 600 words.)

1936 **656 .222.1 = 91 .882**

Saobracajni Pregled, No. 6, p. 167.

POLETI. — **The increase in train speeds.** (5 400 words.)

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New L. M. S. shock-absorbing wagons. (400 words & fig.)

1937 **621 .131.3 (.73) & 621 .133.3 (.73)**
Engineer, No. 4259, August 27, p. 221, and No. 4260, september 3, p. 247.
POULTNEY (E. C.). — **Superheated steam and locomotive performance.** (6 400 words & fig.)

1937 **621 .132.3 (.73)**
Engineer, No. 4260, September 3, p. 250.
American eight-coupled express locomotive. (20[illegible] words.)

1937 **625 .13 (.73)**
Engineer No. 4261, September 10, p. 276.
The Lincoln vehicular tunnel. (3 600 words & fig.)

1937 **621 .8 (.42)**
Engineer, No. 4261, September 10, p. 291.
The scoop controlled hydraulic coupling. (1 000 word[illegible] & fig.)

1937 **669 .[illegible]**
The Metallurgist, Suppl. to the Engineer, August, p. 5[illegible]
Embrittling effects of tempering of steels. (50[illegible] words.)

1937 **669 .[illegible]**
The Metallurgist, Suppl. to the Engineer, August, p. 5[illegible]
The **constitution of manganese steels.** (1 600 words [illegible] fig.)

Engineering. (London.)

1937 **621 .4[illegible]**
Engineering, No. 3734, August 6, p. 139.
GLAISTER (E.). — Some experiments on **combusti[illegible] in oil engines.** (3 000 words & fig.)

1937 **62. (01 & 669**
Engineering, No. 3734, August 6, p. 140.
LEA (F. C.). — **The effect of discontinuities and s[illegible] face conditions on failure under repeated stress.** (4 [illegible] words, figures & tables.)

1937 **621 .43 (.49**
Engineering, N. 3734, August, p. 147.
Diesel-engined railcars for the Swiss Federal R[illegible] ways. (2 200 words & fig.)

1937 **621 .43 & [illegible]**
Engineering, No. 3734, August 6, p. 153.
Diesel-engine fuel. (2 300 words.)

1937 **62. (01 & [illegible]**
Engineering, No. 3734, August 6, p. 155.
The **National Physical Laboratory.** Light alloy[illegible] magnesium. Aluminium alloys. Materials for us[illegible] high temperatures. (6 500 words.)

1937 **535 & 621**
Engineering, No. 3734, August 6, p. 162.
ROLT (F. H.). — The **application of optics to engineering measurements.** (4 500 words & fig.)

1937 **625 .242 (.42) & 625 .246 (.42)**
Engineering, No. 3736, August 20, p. 213.
Shock-absorbing goods wagon, London Midland and Scottish Railway. (700 words.)

1937 **625 .4 (.42)**
Engineering, No. 3737, August 27, p. 229.
Extension of the Central London tube railway. (700 words.)

1937 **621 .13 (0**
Engineering, No. 3737, August 27, p. 234,
The steam locomotive. (3 700 words.)

1937 **69. (.73) & 721 (.73)**
Engineering, No. 3737, August 27, p. 235.
FLEMING (R.). — **The New York City Building Code.** (6 000 words.)

1937 **621 .9**
Engineering, No. 3737, August 27, p. 241.
The walker-turner universal sanding machine. (600 words.)

1937 **656 .213 (.42)**
Engineering, No. 3738, September 3, p. 253.
Bunkering plant for trawlers at fleetwood docks. (2 000 words & fig.)

1937 **621 .338 (064 & 625 .2 (064**
Engineering, No. 3738, September 3, p. 261.
Rolling stock at the Paris exhibition. (1 800 words.)

Engineering News-Record. (New York.)

1937 **62. (01 & 693**
Engineering News Record, No. 5, July 29, p. 180.
DAVIS (R. E.), DAVIS (H. E.) and BROWN (E. H.). — **Plastic flow in concrete.** Abstract of an A.S.T.M., convention paper that evaluates existing knowledge of plastic flow effects in terms of design and construction practice. (3 100 words.)

1937 **625 .13 (.73)**
Engineering News Record, No. 5, July 29, p. 188.
High speed shield tunneling. (2 300 words & fig.)

1937 **625 .13 (.73)**
Engineering News Record. No. 6, August 5, p. 220.
Tunnel looped under a fault. (3 200 words & fig.)

1937 **624 .62 (.73)**
Engineering News Record, No. 7, August 12, p. 257.
SCHROEDL (O. H.). — **Twin tied arches for Baltimore bridge.** (3 300 words & fig.)

1937 **625 .13 (.73)**
Engineering News Record, No. 9, August 26, p. 349.
Lining the Lincoln tunnel. (2 200 words & fig.)

1937 **62. (01 & 625 .13**
Engineering News Record, No. 9, August 26, p. 353.
BERNHARD (R. K.). — **Finding weak spots in bridges.** (3 100 words & fig.)

Journal, Institution of Engineers, Australia. (Sydney, N. S. W.)

1937 **62. (01 & 625 .212**
Journal, Institution of Engineers, Australia, No. 6, June, p. 215.
CANSDELL HIRST (G. W.). — The **development of cracks** in the wheel seats of axles within the hubs of wheels. (12 500 words, figures & tables.)

1937 **62. (01 & 621 .392**
Journal, Institution of Engineers, Australia, No. 6, June, p. 229.
ISAACS (D. V.). — The **distribution of stresses** in fillet welds. (2 800 words.)

1937 **621 .39 (.944)**
Journal. Institution of Engineers, Australia, No. 7, July, p. 259.
MYERS (W. H.). — The **electrical services** at Wynyard Railway Station, Sydney. (9 500 words & fig.)

Minutes of proceedings of the Institution of Civil Engineers. (London.)

1937 **627. (.42)**
Minutes of proceed., Inst. of Civil Engineers, Vol. 240. p. 258.
Major improvement-works of the Port of London Authority, 1925-1930. (28 000 words, figures & tables.)

1937 **624 .62 (.91)**
Minutes of proceed., Instit. of Civil Engineer, Vol. 240, p. 342.
The Iskandar bridge, Perak, Federated Malay States. (5 400 words.)

1937 **624 .8 (.62)**
Minutes of proceed., Instit. of Civil Engineer, Vol. 240, p. 365.
The New Khedive Ismail bridge, Cairo, Egypt. (17 000 words & fig.)

1937 **624 .2 (.42)**
Minutes of proceed., Instit. of Civil Engineer, Vol. 240, p. 537.
Billingham branch bridge. (10 000 words & fig.)

1937 **624 .8 (.42)**
Minutes of proceed., Instit. of Civil Engineer, Vol. 240, p. 567.
« Tees » (Newport) bridge, Middlesbrough. (18 000 words & fig.)

1937 62. (01 & 721
Minutes of proceed., Instit. of Civil Engineer, Vol. 240, p. 619.
The laws of a mass of clay under pressure. (25 000 words & fig.)

Modern Transport. (London.)

1937 656 .23 (.42)
Modern Transport, No. 960, August 7, p. 3.
Railway rates inquiry. Reflections on the recent proceedings before the Tribunal. (2 100 words.)

1937 388. (.42) & 656 .233 (.42)
Modern Transport, No. 960, August 7, p. 4.
London passenger pooling scheme. Board and main-line railways. (1 900 words.)

1937 621 .43 (.44)
Modern Transport, No. 960, August 7, p. 5.
Pneumatic tyred railcars in France. From subsidiary service to main line. (1 800 words & fig.)

1937 656 .261 (.43)
Modern Transport, No. 961, August 14, p. 5.
Road-rail transport in Germany. (1 700 words & fig.)

1937 656 (.42)
Modern Transport, No. 961, August 14, p. 6.
GUPWELL (L. W.). — **Inland goods transport. — Co-ordination** a proved necessity. (1 400 words.)

1937 621 .335 (.44) & 621 .43 (.44)
Modern Transport, No. 961, August 14, p. 9.
A powerful diesel-electric locomotive. (900 words & fig.)

1937 625 .242 (.42) & 625 .246 (.42)
Modern Transport, No. 962, August 21, p. 3.
Shock-absorbing wagons. (1 200 words & fig.)

1937 621 .338 (.45)
Modern Transport, No. 962, August 21, p. 4.
Electric train services in Italy. (900 words & fig.)

1937 656 .254
Modern Transport, No. 962, August 21, p. 5.
Automatic control of trains. (1 200 words & fig.)

1937 656 .225 (.42)
Modern Transport, No. 962, August 21, p. 6.
CHARLTON (S.). — **Containers on British Railways.** (1 900 words.)

1937 625 .13 (.44)
Modern Transport, No. 962, August 21, p. 7.
New tunnel through the Vosges. (1 400 words & fig.)

1937 621 .132.3 (.73) & 621 .132.5 (.73)
Modern Transport, No. 963, August 28, p. 4.
Locomotive practice in the United States. (700 words & fig.)

1937 388 (.42) & 656 .2 (.42)
Modern Transport, No. 963, August 28, p. 5.
Record traffics on the Underground. (1 700 words & 1 plan.)

1937 656. (.51)
Modern Transport, No. 964, September 4, p. p. 3.
MIDDLETON-SMITH (C. A.). — **Transport in China,** No. 1 — A survey of recent progress. (2 500 words & fig.)

1937 625 .232 (.42)
Modern Transport, No. 964, September 5, p. 5.
New rolling stock for London Transport. (2 100 words & fig.)

1937 656 .213 (.42)
Modern Transport, No. 964, September 5, p. 7.
Trawler bunkering at Fleetwood. (1 400 words & fig.)

1937 656 .222.1 (.42)
Modern Transport, No. 964, September 5, p. 9.
L. M. S. Midland section speed-up. **62 mile-a-minut** trains. (800 words.)

1937 656 .222.1 (.42)
Modern Transport, No. 964, September 5, p. 9.
New fast trains on L. N. E. R. Leeds to London i 2 3/4 hours. (900 words.)

Railway Age. (New York.)

1937 625 .232 (.73) & 656 .222.1 (.73
Railway Age, No. 5, July 31, p. 129.
What about the Challenger? Union Pacific coac tourist train makes remarkable record as a traffic-bui der. (3 500 words & fig.)

1937 347 .763.4 (.73) & 656 .222.3 (.73
Railway Age, No. 5, July 31, p. 133.
Senate passes **train-limit bill.** (2 000 words.)

1937 625 .232 (.7
Railway Age, No. 5, July 31, p. 135.
Lackawanna modernizes **buffet-lounge car.** (1 8 words & fig.)

1937 656 .262 (.73) & 697. (.7
Railway Age, No. 6, August 7, p. 158.
Santa Fe air conditions hotel at Needles, Cal. (2 words & fig.)

1937 625 .232 (.7
Railway Age, No. 6, August 7, p. 161.
Nickel Plate modernizes diner. (700 words & fig.)

1937 625 .243 (.73) & 625 .246 (.7
Railway Age, No. 6, August 7, p. 163.
The D. & H. builds **lightweight welded freight c** (1 400 words & fig.)

1937 **625 .261 (.73)**
Railway Age, No. 7, August 14, p. 200.
Railroad builds large plant for truck operator. (2 800 words & fig.)

1937 **621 .43 (.71)**
Railway Age, No. 7, August 14, p. 208.
SYLVESTER (I. I.). — **Diesel-engine maintenance** on the Canadian National. (3 600 words, fig. & tables.)

1937 **621 .139 (.73), 625 .18 (.73) & 625 .27 (.73)**
Railway Age, No. 8, August 21, p. 227, and No. 9, August 28, p. 276.
Unusual methods mark P. R. R. **supply work.** (4 600 words & fig.)

1937 **621 .133.3**
Railway Age, No. 8, August 21, p. 231.
OATLEY (H. B.). — What limit to **superheat** for steam locomotives ? (1 900 words.)

1937 **656 .27 (.73)**
Railway Age, No. 8, August 21, p. 233.
Operating local stations. (2 600 words & fig.)

1937 **624 .2 (.73)**
Railway Age, No. 8, August 21, p. 237.
Grade separation viaduct built of treated wood. (1 200 words & fig.)

1937 **652 & 654**
Railway Age, No. 8, August 21, p. 239.
ROGERS (W.). — **Teletype service** on Mo. P. (1 400 words & fig.)

1937 **621 .43 (.73)**
Railway Age No. 9, August 28, p. 256.
Rock Island places new trains in **high speed service.** (6 400 words & fig.)

1937 **625 .111 (.73)**
Railway Age, No. 9, August 28, p. 267.
Difficult problems solved in relocating inundated line. (4 600 words & fig.)

1937 **621 .333**
Railway Age, No. 9, August 28, p. 273.
BROEKMANN (L. F.). — **Electrification at commercial frequencies.** European experience indicates the possibility of further developing the single-phase motor. (1 500 words & fig.)

1937 **656 .261 (.73)**
Railway Age, No. 9, August 28, p. 279.
Burlington trucks make their schedules safely. (2 000 words & fig.)

1937 **656 .1 (.73)**
Railway Age, No. 9, August 28, p. 282.
Motor transport outlined in annual reports. (3 600 words.)

Railway Engineering and Maintenance. (Chicago.)

1937 **621 .392 (.73) & 621 .173 (.73)**
Railway Engineering and Maintenance, August, p. 532.
Making rail last longer on the Missouri Pacific. (2 500 words & fig.)

1937 **625 .13 (.73)**
Railway Engineering and Maintenance, August, p. 536.
Use second-hand steel in wood trestles. (1 000 words & fig.)

1937 **625 .14 & 656 .222.1**
Railway Engineering and Maintenance, August, p. 538.
Do higher speeds increase track labor costs ? (2 600 words & fig.)

1937 **621 .392 (.73) & 625 .173 (.73)**
Railway Engineering and Maintenance, August, p. 543.
TRACY (S. E.). — Welding special trackwork — How the Burlington does it. (3 000 words & fig.)

Railway Gazette. (London.)

1937 **621 .138.1 (.42) & 725 .33 (.42)**
Railway Gazette, No. 6, August 6, p. 237.
An up-to-date locomotive depot. (1 100 words & fig.)

1937 **656 .283 (.42)**
Railway Gazette, No. 6, August 6, p. 246.
Ministry of transport accident report. (4 000 words.)

1937 **656 .281 (.42)**
Railway Gazette No. 6, August 6, p. 250.
Serious accident on P. L. M. railway. (900 words & fig.)

1937 **385. (093 (.43)**
Railway Gazette, No. 7, August 13, p. 280.
The Berlin-Hamburg railway. (1 900 words.)

1937 **621 .134.1 (.42) & 621 .138.5 (.42)**
Railway Gazette, No. 7, August 13, p. 282, and No. 8, August 20, p. 319.
The repair of locomotive motion details — I. (3 600 words & fig.)

1937 **621 .132.3 (.73)**
Railway Gazette, No. 7, August 13, p. 289.
New streamlined express locomotives, New York, New Haven & Hartford Railroad. (500 words & fig.)

1937 **385. (08 (.493)**
Railway Gazette, No. 8, August 20, p. 317.
Ten years of the Belgian National Railways. (1 500 words.)

1937 **625 .172 (.42)**
Railway Gazette, No. 8, August 20, p. 323.
New weed-killing train. Great Western Railway. (300 words & fig.)

1937 625 .242 (.42) & 625 .246 (.42)
Railway Gazette, No. 8, August 20, p. 330.
New shock-absorbing 12-ton L. M. S. R. freight wagon. (700 words & fig.)

1937 621 .392 (.54) & 625 .143
Railway Gazette, No. 9, August 27, p. 355.
Reconditioning points and crossings on the Burma Railways. (900 words.)

1937 656 .1 (.42)
Railway Gazette, No. 9, August 27, p. 359.
BEVERIDGE (R.). — The Scottish Motor Traction group — II. (1 700 words.)

1937 656 .254 (.485)
Railway Gazette, No. 9, August 27, p. 369.
Wireless signaling for shunting yards. (250 words & fig.)

1937 62. (01 (.44) & 625 .172 (.44)
Railway Gazette, No. 10, September 3, p. 390.
Stability of railway vehicles. (1 200 words)

1937 385 .1 (.51)
Railway Gazette, No. 10, September 3, p. 391.
General Hammond's **report on the Chinese Railways.** (2 800 words.)

1937 624 .7 (.489)
Railway Gazette, No. 10, September 3, p. 394.
The Oddesund bridge, Denmark. (1 300 words & fig.)

1937 656 .213 (.42)
Railway Gazette, No. 10, September 3, p. 396.
Improved trawler bunkering facilities at Fleetwood. (800 words & fig.)

1937 625 .232 (.82)
Railway Gazette, No. 10, September 3, p. 399.
Day saloon coaches for Mar del Plata service, B. A. G. S. R. (500 words & fig.)

1937 621 .132.8 (.73)
Railway Gazette, No. 10, September 3, p. 400.
New articulated locomotives, Southern Pacific Railway. (700 words & fig.)

1937 621 .9 (.42)
Railway Gazette, No. 10, september 3, p. 402.
A new railway shop machine tool. (500 words & fig.)

1937 621 .338 (.42)
Railway Gazette, No. 10, September 3, p. 407.
New surface-line rolling stock for the London Passenger Transport Board. (600 words & fig.)

1937 621 .43 (∞)
Diesel Railway Traction, suppl. to the Railway Gazette, August 6, p. 258, and September 3, p. 417.
Railcar oil engines. (8 000 words & fig.)

1937 621 .43 (.437)
Diesel Railway Traction, supplt. to the Railway Gazette, August 6, p. 263.
A main-line railcar design in Czechoslovakia. (600 words & fig.)

1937 621 .43 & 625 .4
Diesel Railway Traction, supplt. to the Railway Gazette, August 6, p. 264.
Diesel locomotives underground. (1 900 words.)

1937 621 .43 (.45) & 625 .26 (.45)
Diesel Railway Traction, supplt. to the Railway Gazette, August 6, p. 265.
Railcar maintenance on the Italian State Railways. (600 words.)

1937 621 .132.7 (.42) & 621 .43 (.42)
Diesel Railway Traction, supplt. to the Railway Gazette, September 3, p. 414.
The work of the L. M. S. R. **diesel electric shunters.** (1 200 words & fig.)

1937 621 .43 (.71)
Diesel Railway Traction, supplt. to the Railway Gazette, September 3, p. 416.
Canadian National **railcar experience.** (1 000 words.)

1937 621 .43 (.42)
Diesel Railway Traction, supplt. to the Railway Gazette, September 3. p. 425.
A small industrial shunting locomotive. (400 words & fig.)

1937 621 .43 (.4
Diesel Railway Traction, supplt. to the Railway Gazette, September 3. p. 426.
Diesel-hydraulic locomotive on the Continent. (words & fig.)

1937 621 .335 (.45) & 621 .338 (.4
Electric Railway Traction, supplt. to the Railway Gazette, August 20, p. 338.
High-speed trains in Italy. (1 900 words & fig.)

1937 621 .335 (.44) & 621 .338 (.
Electric Railway Traction, supplt. to the Railway Gazette, August 20, p. 342.
Stainless steel electric trains in France. (1 600 words & fig.)

The Railway Magazine. (London.)

1937 625 .232 (
Railway Magazine, No. 482, August, p. 79.
VOYAGEUR. — **The L. N. E. R. Coronation exp**
(1 600 words & fig.)

1937 625 .61 (
Railway Magazine, No. 482, August, p. 82.
GOODYER (W.). — **The Wisbech and Upwell tramway.** (3 100 words & fig.)

1937 **656 .222.1 (.42)**
ailway Magazine, No. 482, August, p. 90, and No. 483, September, p. 167.
ALLEN (C. J.). — **British locomotive practice** and erformance. (9 600 words & fig.)

1937 **621 .33 (.42)**
ailway Magazine, No. 482, August, p. 105.
REED (B.). — **Electrification** to Portsmouth and lton. (1 400 words & fig.)

1937 **656 .222.1 (.42)**
ailway Magazine, No. 482, August, p. 111.
ALLEN (C. J.). — The new L. M. S.- and L. N. E. peed records. (3 000 words & fig.)

1937 **621 .132.1 (.42)**
ailway Magazine, No. 482, August, p. 119.
NOCK (O. S.). — **The locomotives of the L. M. S. R.,** . C. C. Section. (3 500 words & fig.)

1937 **621 .134.4**
ailway Magazine, No. 483, September, p. 163.
DENDY MARSHALL (C. F.). — **Who invented the mpound locomotive ?** (900 words & fig.)

1937 **656 .211 (093)**
ilway Magazine, No. 483, September, p. 181.
BARRIE (D. S.). — The **story of Euston** — II. (4 400 ords & fig.)

1937 **625 .232 (.42)**
ilway Magazine, No. 483, September, p. 191.
HAMILTON ELLIS (C.). — **Royal trains** — II. — The outhern Railway. (3 500 words & fig.)

1937 **656 .222.1 (.44)**
ilway Magazine, No. 483, September, p. 199.
MERCURY. — **Recent locomotive work in France.** — Paris-Orléans-Midi. (4 400 words & fig.) (To be ntinued.)

Railway Mechanical Engineer. (New York.)

1937 **621 .335 (.73) & 621 .43 (.73)**
ilway Mechanical Engineer, No. 8, August, p. 339.
Birmingham Southern installs five **900-H.P. diesel itchers.** (2 300 words & fig.)

1937 **625 .244 (.73)**
ilway Mechanical Engineer, No. 8, August, p. 346.
GORMAN, Jr. (E. A.). — Results of refrigerator-car **-meltage tests.** (1 500 words & fig.)

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937 **621 .134.1 (.73) & 621 .135.2 (.73)**
ilway Mechanical Engineer, No. 8, August, p. 348.
Design features of lightweight **modern locomotive uipment** — I. A discussion of the development and earch problems involved in the design of Timken ntweight reciprocating and rotating parts for locotives. (2 300 words, figures & tables). (To be conued.)

1937 **621 .133.3 & 621 .138.5**
Railway Mechanical Engineer, No. 8, August, p. 352.
MARRISON (J. P.). — Determining the **strength of riveted patches.** (4 000 words, figures & tables.)

Railway Signaling. (Chicago.)

1937 **656 .256.3 (.73)**
Railway Signaling, August, p. 447.
Signal construction on the Wabash. (5 300 words & fig.)

1937 **656 .259**
Railway Signaling, August, p. 454.
TORWNE (H. M.). — **Lightning protection** for signal power distribution circuits. (3 500 words & fig.)

1937 **656 .256.3 (.42)**
Railway Signaling, August, p. 458.
Missouri Pacific installs automatics on 235 miles in 102 working days. (2 400 words & fig.)

1937 **625 .162 (.73) & 656 .259 (.73)**
Railway Signaling, August, p. 465.
Automatic gates on the Erie. (1 100 words & fig.)

The Locomotive. (London.)

1937 **621 .43**
The Locomotive, No. 540, August 14, p. 235.
Diesel locomotives. (1 400 words.)

1937 **621 .132.3 (.43)**
The Locomotive, No. 540, August 14, p. 236.
Streamlined & semi-streamlined locomotives. German National Railways. (400 words & fig.)

1937 **621 .132.1 (.44)**
The Locomotive, No. 540, August 14, p. 238.
Recent developments in **French steam locomotives.** (2 800 words & fig.)

1937 **621 .132.3 (.439)**
The Locomotive, No. 540, August 14, p. 243.
Stream-lined 4-4-4 type tank locomotive, Hungarian State Railways. (600 words & fig.)

1937 **625 .232 (.44)**
The Locomotive, No. 540, August 14, p. 245.
New tubular coaches, French State Railways. (2 100 words & fig.)

1937 **621 .135 (01**
The Locomotive, No. 540, August 14, p. 249.
A century of balancing. (2 200 words & fig.)

1937 **385. (092**
The Locomotive, N° 540, August 14, p. 253.
HAMILTON-ELLIS (C.). — **Famous locomotive engineers.** — II. — David Jones. (3 800 words & fig.)

1937 **621 .43 (.73)**
The Locomotive, No. 540, August 14, p. 261.
Baltimore & Ohio Railroad. — **3 600 H. P. Diesel electric locomotives.** (1 900 words & fig.)

1937 **621 .132.3 (.945)**
The Locomotive, No. 540, August, p. 263.
Streamlined locomotives, Victorian Railways. (1 100 words & fig.)

The Oil Engine. (London.)

1937 **621 .43 (.42)**
The Oil Engine, No. 52, mid August, p. 109.
Diesel trains for British railways. (600 words.)

1937 **621 .132.7 (.42) & 621 .43 (.42)**
The Oil Engine, No. 52, mid August, p. 112.
144-hour week for L. M. S. R. locomotives. (1 000 words & fig.)

1937 **621 .43 (.73)**
The Oil Engine, No. 52, mid August, p. 118.
Luxury train has four 900 b. h. p. engines. (200 words & fig.)

1937 **621 .43 (.43)**
The Oil Engine, No. 52, Mid August, p. 121.
The development of the direct-drive locomotive. (500 words & fig.)

Transit Journal. (New York.)

1937 **621 .332**
Transit Journal, August, p. 286.
KENNEDY (M.). — **Combating third rail surges.** (1 500 words & fig.)

1937 **621 .33 (.42)**
Transit Journal, August, p. 288.
Britishers like trolley buses. (1 500 words & fig.)

1937 **621 .336 (.73)**
Transit Journal, August, p. 294.
KINGSBURY (C. R.). — **Trolley guards require proper support.** (900 words & fig.)

In Spanish.

Boletín de la Asociación international permanente del Congreso Sudamericano de ferrocarriles. (Buenos Aires.)

1936 **621 .43 (.82) & 625 .2 (.82)**
Boletín de la Asoc. intern. perm. del Congreso Sudamer. de ferroc., enero-marzo, p. 17.
El **nuevo material rodante** adquirido por los Ferrocarriles del Estado de la República argentina. (3 000 palabras & fig.)

1936 **621 .132.1 (.82)**
Boletín de la Asoc. intern. perm. del Congreso Sudamer. de ferroc., abril-junio, p. 31.
ELDER (A.). — Las **nuevas locomotoras** del Ferrocarril Pacifico. (1 900 palabras & fig.)

1936 **385 .52 (.3)**
Boletín de la Asoc. intern. perm. del Congreso Sudamer. de ferroc., abril-junio, p. 45.
Proporción de los **salarios ferroviarios,** en diversos países, con relación al total de los gastos y entradas del Instituto de Estudios económicos del transporte. (1 000 palabras & fig.)

1936 **385 .113 (.81)**
Boletín de la Asoc. intern. perm. del Congreso Sudamer de ferroc., abril-junio, p. 87.
NUNEZ BRIAN (J.). — Los **ferrocarriles** en el Brasil. (3 300 palabras & fig.)

1936 **621 .4[illegible]**
Boletín de la Asoc. intern. perm. del Congreso Sudame[illegible] de ferroc., julio-septiembre, p. 49.
NUNEZ BRIAN (J.). — Los **automotores ferroviario[illegible]** con motor independiente. (3 800 palabras & fig.)

1936 **313 .38[illegible]**
Boletín de la Asoc. intern. perm. del Congreso Sudame[illegible] de ferroc., julio-septiembre, p. 57; octubre-diciem[illegible]bre, p. 41.
JUNG (F.). — La **estadística ferroviaria.** (23 000 pal[illegible]bras.)

1937 **656. (.82[illegible]**
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(= 91.885)

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1937 **656 .233 (.43)**
Die Reichsbahn, Heft 41, 13. Oktober, S. 916.
FISCHL. — **Abrechnung zwischen Reichsbahn und Privatbahnen im Personenverkehr.** (4 700 Wörter.)

1937 **656 .235.7 (.43)**
Die Reichsbahn, Heft 41, 13. Oktober, S. 921.
PRINZ. — **Eisenbahn und Landwirtschaft.** (2 100 Wörter.)

Elektrische Bahnen. (Berlin.)

1937 **621 .33**
Elektrische Bahnen, August-September, S. 189.
WECHMANN (W.). — Neuere **Energieversorgungsmöglichkeiten elektrischer Wechselstrombahnen.** (2 000 Wörter.)

1937 **621 .331 (.494)**
Elektrische Bahnen, August-September, S. 191.
SCHMITT. — Bau der **Umrichteranlage** in Basel, Betrieb und Wirtschaftlichkeit. (7 700 Wörter & Abb.)

1937 **621 .331**
Elektrische Bahnen, August-September, S. 203.
REINHARDT (G.). — Die **Wirkungsweise des Umrichters.** (3 500 Wörter & Abb.)

1937 **621 .331**
Elektrische Bahnen, August-September, S. 208.
GEISE (H.). — Die **Oberwellen der Umrichteranlage Basel** und die Massnahmen zu ihrer Verminderung. (4 300 Wörter & Abb.)

1937 **621 .331**
Elektrische Bahnen, August-September, S. 221.
EPPEN (F.) & KLEWE (H.). — Beeinflussung von **Rundfunkempfang** und **Fernsprechbetrieb** durch die **Umrichteranlage.** (2 900 Wörter, 4 Tafeln & Abb.)

1937 **621 .331**
Elektrische Bahnen, August-September, S. 226.
TRÖGER (R.). — Aussichten für die Fortentwicklung des **Umrichters** und seine Anwendung im Bahnbetrieb. (1 900 Wörter.)

Glasers Annalen. (Berlin.)

1937 **625 .231**
Glasers Annalen, Heft 6, 15. September, S. 93.
THEOBALD. — **Hundert Jahre Doppelstock-Personenwagen** auf deutschen und ausländischen Bahnen. (3 500 Wörter.)

1937 **621 .43 (.43)**
Glasers Annalen, Heft 6, 15. September, S. 98.
MARQUARDT. — 2 × 150 P. S. **dieselmechanischer Triebwagen** der Niederbarnimer Eisenbahn A. G. (2 000 Wörter & Abb.)

Organ für die Fortschritte des Eisenbahnwesens. (Berlin.)

1937 **621 .134.5 (.43)**
Organ für die Fortschr. des Eisenbahnw., Heft 19, 1. Oktober, S. 54.
HOLTMEYER. — **Lager- und Schmierungsfragen** bei Reichsbahnlokomotiven. (7 500 Wörter & Abb.)

1937 **625 .14 & 656 .222.1**
Organ für die Fortschr. des Eisenbahnw., Heft 19, 1. Oktober, S. 358.
CHRISTENSEN (Chr. B.). — **Fahrgeschwindigkeit** und Genauigkeit der Gleislage. (1 500 Wörter & Abb.)

1937 **625 .14 (01**
Organ für die Fortschr. des Eisenbahnw., Heft 20, 15. Oktober, S. 369.
MEIER (H.). — Ein vereinfachtes Verfahren zur theoretischen Untersuchung der **Gleisverwerfung.** (9 900 Wörter, 7 Tafeln & Abb.)

1937 **625 .141**
Organ für die Fortschr. des Eisenbahnw., Heft 20, 15. Oktober, S. 381.
Bahnunterbau : Brücken und Tunnel, Bahnoberbau. (2 400 Wörter & Abb.)

Zeitschrift des Vereines Deutscher Ingenieure. (Berlin.)

1937 **621 .139 (.44), 625 .18 (.44) & 625 .27 (.44)**
Zeitschr. des Ver. deutsch. Ing., Nr. 39, 25. September, S. 1129.
HAAS (Ph.). — **Altmetall-Wirtschaft** im Betriebe. (4 600 Wörter & Abb.)

1937 **624 .51 (.73)**
Zeitschr. des Ver. deutsch. Ing., Nr. 39, 25. September, S. 1143.
SEILER (E.). — Die **Hängebrücke** über dem Goldenen Tor bei San Franzisko. (3 200 Wörter & Abb.)

1937 **625 .143.2**
Zeitschr. des Ver. deutsch. Ing., Nr. 39, 25. September, S. 1149.
Die Umgestaltung des **Primärgefüges im Schienenfuss** durch Walzen. (600 Wörter.)

1937 **691 & 693**
Zeitschr. des Ver. deutsch. Ing., Nr. 42, 16. Oktober, S. 1215.
EITEL (W.). — Neue Wege der **Zementforschung.** (2 500 Wörter & Abb.)

Zeitschrift für das gesamte Eisenbahn-Sicherungs- und Fernmeldewesen. (Berlin.)

1937 **656 .256**
Zeitschr. für das ges. Eisenb.-Sicherungs- und Fermeldewesen, Nr. 13, 10. Oktober, S. 157.
BUDDENBERG (A.). — **Schienenstromschliesser.** (4 700 Wörter & Abb.) (Fortsetzung folgt.)

Zeitung des Vereins mitteleuropäischer Eisenbahnverwaltungen. (Berlin.)

1937 **385. (09 (.48)**
Zeitung des Ver. Mitteleurop. Eisenbahnverw., Nr. 38, 23. September, S. 671.
PASZKOWSKI (F.). — **Eisenbahnpolitischer Streifzug** durch die nordischen Staaten. (6 400 Wörter & Abb.)

1937 **385 .113 (.52)**
Zeitung des Ver. Mitteleurop. Eisenbahnverw., Nr. 38, 23. September, S. 679.
Weiterer Aufschwung der Japanischen Staatsbahnen 1934-35. (2 400 Wörter.)

1937 **624. (.489) & 656 .211.7 (.489)**
Zeitung des Ver. Mitteleurop. Eisenbahnverw., Nr. 39, 30. September, S. 691.
MUNCK PETERSEN (C.). — **Fährstrecken und Brükken** in Dänemark unter besonderer Berücksichtigung der Storstrom-Brücke. (5 200 Wörter & Abb.)

1937 **385 (.492)**
Zeitung des Ver. Mitteleurop. Eisenbahnverw., Nr. 39, 30. September, S. 701.
TISSOT VAN PATOT. — Die **Reorganisation** der Niederländischen Eisenbahnen. (1 900 Wörter.)

1937 **385 .4 (.44)**

Zeitung des Ver. Mitteleurop. Eisenbahnverw., Nr. 40, 7. Oktober, S. 709.

Die **Neuordnung** im französischen Eisenbahnwesen. (4 800 Wörter.)

1937 **385 .113 (.68)**

Zeitung des Ver. Mitteleurop. Eisenbahnverw., Nr. 40, 7. Oktober, S. 715.

MEYER (H. K.). — Die **Südafrikanischen Staatsbahnen im Jahre 1935-36.** (4 300 Wörter.)

1937 **385 .63**

Zeitung des Ver. Mitteleurop. Eisenbahnverw., Nr. 41, 14. Oktober, S. 729.

HOFFMANN (J.). — Vorschriften für die **Veröffentlichung internationaler Gütertarife.** (3 200 Wörter.)

1937 **385 .113 (.485)**

Zeitung des Ver. Mitteleurop. Eisenbahnverw., Nr. 41, 14. Oktober, S. 738.

PASZKOWSKI. — Die **Schwedische Staatsbahn** im Jahre 1936. (2 700 Wörter.)

In English.

Bulletin, American Railway Engineering Association. (Chicago, Ill.)

1937 **621**

Bulletin, Americ. Ry. Eng. Assoc., No. 397, September, p. 5.

Report of Committee I.— **Power supply.** (2 000 words.)

1937 **62. (01 (.73) & 691 (.73)**

Bulletin, Americ. Ry. Eng. Assoc., No. 397, September, p. 10.

Report of Committee II — **Electrolysis.** Study of leakage of stray current through foundations of catenary structures, also electrolytic corrosion of insulator hardware. — Report on methods which have been used in various parts of the country in coordinated studies of electrolysis problems. — Report on methods which have been used to isolate the return traction circuits from foreign return circuits. — Increased stray current on underground structures brought about by the bonding for the propulsion current of electrified railroad trackage as compared with condition before electrification methods of draining such underground structures. — Need of a suitable design for an insulated joint for high pressure steam pipes. — The use of protective coatings for underground pipes and other structures including the application of synthetic rubber compounds. (6 000 words.)

1937 **621 .336 (.73)**

Bulletin, Americ. Ry. Eng. Assoc., No. 397, September, p. 24.

Report of Committee III — **Overhead transmission line and catenary construction.** — Specification for bronze messenger cable. — Tolerances for grooved trolley wire. (2 300 words.)

1937 **65 (.73)**

Bulletin, Americ. Ry. Eng. Assoc., No. 397, September, p. 29.

Report of Committee IV. **Standardization of apparatus and materials.** (400 words.)

1937 **621 .39 (.73)**

Bulletin, Americ. Ry. Eng. Assoc., No. 397, September, p. 31.

Report of Committee V — **Electric heating and welding.** — Welding accessories and safety precautions. (1 300 words & fig.)

1937 **621 .3 (.73)**

Bulletin, Americ. Ry. Eng. Assoc., No. 397, September, p. 40.

Report of Committee VI — **Application of motors.** — Greasing ball and roller bearings. **Size of cables for feeders.** (1 200 words.)

1937 **621 .336 (.73)**

Bulletin, Americ. Ry. Eng. Assoc., No. 397, September, p. 43.

Report of Committee VII — **Clearances for third rail and overhead working conductors.** (1 700 words.)

1937 **614 .8 (.73) & 621 .33 (.73)**

Bulletin, Americ. Ry. Eng. Assoc., No. 397, September, p. 47.

Report of Committee VIII — **Protective devices and safety rules in electrified territory.** (400 words.)

1937 **621 .336 (.73)**

Bulletin, Americ. Ry. Eng. Assoc., No. 397, September, p. 48.

Report of Committee IX —**Specifications for track and third rail bonds.** (1 100 words.)

1937 **621 .32 (.73)**

Bulletin, Americ. Ry. Eng. Assoc., No. 397, September, p. 50

Report of Committee X — **Illumination.** (1 800 words & tables.

1937 **621 .31 (.73)**

Bulletin, Americ. Ry. Eng. Assoc., No. 397, September, p.

Report of Committee XI — **Design of indoor and outdoor substations.** (500 words.)

1937 **621 .332 (.73)**

Bulletin, Americ. Ry. Eng. Assoc., No. 397, September, p. 58.

Report of Committee XII — **High tension cables.** (400 words.)

1937 **62. (01 & 621 .33**

Bulletin, Americ. Ry. Eng. Assoc., No. 397, September, p. 59.

Report of Committee XIII — **Application of corrosion-resisting material to railroad electrical construction.** (400 words.)

1937 **016. (621.33**

Bulletin, Americ. Ry. Eng. Assoc., No. 397, September, p. 61.

Applications of electricity to railways. July, 1936 — June, 1937. Bibliography of periodical articles appearing in a select list of periodicals.

Electrical Industries. (London.)

1937 **621 .18**

Electrical Industries, No. 1901, September 15, p. 1181.

SAMUEL (F. J.). — **Practical boiler problems.** (3 100 words & fig.)

1937 **621 .35**

Electrical Industries, No. 1902, September 22, p. 1209.

SANDERSON (E. R.). — **Storage batteries for emergency uses.** (2 600 words & fig.)

1937 **621 .31**

Electrical Industries, No. 1903, October, p. 1245.

MORRIS (E. T.). — **Surge protection for transformers.** (3 000 words & fig.)

1937 **621 .39 & 697**

Electrical Industries, October, p. 1260.

BERNARD (J. I.). — **Air conditioning.** (3 300 words & fig.)

Engineer. (London.)

1937 **625 .13 (.73)**

Engineer, No. 4262, September 17, p. 302.

The Lincoln vehicular tunnel. (3 200 words & fig.)

1937 **669. (06 (.42)**

Engineer, No. 4262, September 17, p. 306.

The Institute of metals. (Precision extensometer. Cold rolling of two-phase alloys. Antimony-cadmium-tin alloys. etc.). (3 600 words.)

1937 **62. (06 (.42)**

Engineer, No. 4262, September 17, p. 312, and No. 4263, September 24, p. 340.

The British Association. (9 700 words.)

1937 **62. (064 (.42)**

Engineer, No. 4262, September 17, p. 314; No. 4263, September 24, p. 330; No. 4264, October 1, p. 356; No. 4265, October 8, p. 384 and No. 4266, October 15, p. 411.

Engineering and Marine exhibition at Olympia. (30 000 words & fig.)

1937 **62. (064 (.42)**

Engineer, Supplement, September 17 and September 24.

Engineering and Marine exhibition at Olympia. (24 pages & fig.)

1937 **669 .1 (06 (.42)**

Engineer, No. 4263, September 24, p. 328.

The Iron and Steel Institute. (Reports upon blast-furnace field tests. Hot metal practice, etc.). (5 600 words.) (To be continued.)

1937 **624 .2**

Engineer, No. 4263, September 24, p. 335.

EVANS (R. H.). — **Strain and stress distribution in doubly reinforced concrete beams.** (2 600 words & fig.)

1937 **01**

Engineer, No. 4263, September 24, p. 346.

BRADFORD (S. C.). — **The documentation centre at the Science Library.** (3 000 words.)

1937 **621 .43 (.42)**

Engineer, No. 4264, October 1, p. 374.

A road-rail shunting tractor. (900 words & fig.)

1937 **536 & 669 .1**

Engineer, No. 4265, October 8, p. 382.

FIEGEHEN (E. G.). — **A study of heat transfer in an annealing furnace.** (6 000 words & fig.)

1937 **625 .232 (.42)**

Engineer, No. 4265, October 8, p. 392.

New L. N. E. R. trains. (600 words & fig.)

1937 **621 .43**

Engineer, No. 4265, October 8, p. 400.

The Buchi supercharging system. (1 400 words & fig.)

1937 **621 .33**

Engineer, No. 4265, October 8, p. 401.

Metadyne control for D. C. traction equipments. (600 words & fig.)

1937 **62. (01 & 621 .115**

Engineer, No. 4265, October 8, p. 402.

MAY (R.). — **Condenser tube corrosion.** (Paper presented before the Institute of Marine Engineers.) (4 500 words.)

1937 **621 .89**

Engineer, No. 4266, October 15, p. 422.

Lubrication and lubricants. (5 000 words.)

1937 **621 .132.3 (.42)**

Engineer, No. 4266, October 15, p. 426.

Streamlined L. N. E. R. engines. (300 words & fig.)

1937 **625 .232 (.42)**

Engineer, No. 4266, October 15, p. 427.

New L. M. S. Post office sorting vans. (200 words & fig.)

1937 **38 & 62**

Engineer, No. 4266, October 15, p. 428.

GIBB (Sir A.). — **Engineering limitations and transport ideals.** (1 500 words.)

Engineering. (London.)

1937 **62. (064 (.42)**

Engineering, No. 3740, September 17, p. 301; No. 3741, September 24, p. 333, and No. 3742, October 1, p. 366.

Engineering and Marine Exhibition at Olympia. (60 000 words & fig.) (To be continued.)

1937 **62. (06 (.42)**

Engineering, No. 3740, September 17, p. 319; No. 3741, September 24, p. 351, and No. 3742, October 1, p. 379.

The British Association meeting at Nottingham. Air conditioning. Sleeve-bearing lubrication. Electrical vibrations, etc. (10 800 words.) (To be continued.)

1937 **669. (06 (.42)**

Engineering, No. 3740, September 17, p. 320 and No. 3742 October 1, p. 382.

The Institute of Metals: Sheffield meeting. Copper-nickel-aluminium alloys. The nickel-aluminium system. The testing of zinc coatings. Mechanical tests at ultra-high speeds, etc. (8 000 words.) (To be continued.)

1937 **621 .89**

Engineering, No. 3740, September 17, p. 325.

SWIFT (H. W.) and HASLEGRAVE (Ph. D.). — **Experiments on sleeve bearing lubrication.** (Paper read before section G of the British Association. (6 000 words & fig.)

1937 **656 .283 (.42)**

Engineering, No. 3740, September 17, p. 328.

The Swanley Junction railway accident. (600 words.)

1937 **669 .1 (06 (.42)**

Engineering, No. 3741, September 24, p. 350.

The Iron and Steel Institute; Middlesbrough meeting. (5 600 words.)

1937 **624. (.489)**

Engineering, No. 3742, October 1, p. 372.

The Storström Railway and road bridge. Denmark. (2 400 words & fig.)

1937 **62. (01 & 669 .1**

Engineering, No. 3742, October 1, p. 387.

SIMS (L. G. A.). — Note on the A. C. method in **permeability testing.** (Paper read before section G of the British Association at Nottingham.) (3 200 words & fig.)

1937 **621 .43 (.82)**

Engineering, No. 3742, October 1, p. 390.

120-H. P. oil-engine railcar with torque converter. (1 200 words & fig.)

1937 **621 .337**

Engineering, No. 3743, October 8, p. 400.

Electro-pneumatic camshaft control for multiple unit operation. (2 000 words & fig.)

1937 **621 .43 (.45)**

Engineering, No. 3743, October 8, p. 416.

Coupled « Littorina » railcars. (500 words.)

1937 **621 .43**

Engineering, No. 3744, October 15, p. 417.

JAFAR (D.). — **Pilot injection.** (3 300 words & fig.)

1937 **625 .232 (.42) & 656 .222.1 (.42)**

Engineering, No. 3744, October 15, p. 426.

The **« East Anglian »** express on the L. N. E. R. (1 000 words & fig.)

1937 **621 .89**

Engineering, No. 3744, October 15, p. 436.

Journal and thrust bearings (Report by Professor H. W. Swift, M. A., D. Sc. on the papers contributed to group I of the general discussion on lubrication and lubricants; Institution of Mechanical Engineers, October 13 to 15, 1937.) (5 500 words.)

1937 **621 .43 (.73)**

Engineering, No. 3744, October 15, p. 439.

900-H.P. supercharged diesel locomotive. (700 words & fig.)

1937 **62. (01 & 669 .1**

Engineering, No. 3744, October 15, p. 439.

GREIG (J.). — **Flux distortion in iron testing.** (2 700 words & fig.)

1937 **01**

Engineering, No. 3744, October 15, p. 441.

BRADFORD (S. C.) — **The international organisation of bibliography.** (2 700 words.)

Engineering News-Record. (New York.)

1937 **625 .1 (.73)**

Engineering News-Record, No. 10, September 2, p. 381.

Rebuilding the Moffat Railroad. (4 300 words & fig.)

1937 **624 .1**

Engineering News-Record, No. 11, September 9, p. 421.

Unusual foundation plant for long bridge over the Neches River, near Port Arthur. (2 100 words & fig.)

1937 **625 .13 (.73)**

Engineering News-Record, No. 12, September 16, p. 481.

Underpinning a busy **railroad viaduct.** (1 000 words & fig.)

1937 **624. (.73)**

Engineering News-Record, No. 13, September 23, p. 501.

SUMMER (L. G.). — **Bridges on the Merritt Parkway.** (3 400 words & fig.)

1937 **621 .392 (.73) & 721 .9 (.73)**

Engineering News-Record, No. 13, September 23, p. 509.

FISH (G. D.). — **Welding for New York buildings.** (4 400 words.)

1937 **624 .32 (.73) & 656 .284 (.73)**

Engineering News-Record, No. 15, October 7, p. 600.

Unusual train wreck fails to dislodge steel truss. (600 words & fig.)

1937 **721 .1**

Engineering News-Record, No. 15, October 7, p. 606.

CHAMBERS (R. H.). — **Tolerances and reinforcing for tilted cylindrical piers.** (1 600 words & fig.)

Mechanical Engineering. (New York.)

1937 **537 .8**
Mechanical Engineering, No. 9, September, p. 653.
HATHAWAY (C. M.) and LEE (E. S.). — **The electric gage.** (3 800 words & fig.)

1937 **621 .13 (01**
Mechanical Engineering, No. 9, September, p. 669.
Steam locomotives. (Association of American Railways.) (900 words.)

1937 **621 .392**
Mechanical Engineering, No. 10, October, p. 733.
COCHRANE (A. G.). — **Arc-welding practice in the machine shop.** (Contributed by the Machine shop practice division for presentation at the Fall Meeting, Erie. Pa., Oct. 4-6, 1937, of the American Society of Mechanical Engineers.) (4 500 words & fig.)

1937 **697**
Mechanical Engineering, No. 10, October, p. 743.
HELMRICH (G. B.). — **Residence and small office air conditioning.** (5 200 words & fig.)

1937 **62. (01 & 621 .131.3**
Mechanical Engineering, No. 10, October, p. 749.
CULVER (E. P.). — Investigation of a simple form of **hydraulic dynamometer.** (3 000 words & fig.)

1937 **62. (01 & 621**
Mechanical Engineering, No. 10, October, p. 763.
BERNHARD (R. K.). — **Dynamic properties of structures determined by models.** (2 000 words & fig.)

Modern Transport. (London.)

1937 **625 .111 (.42)**
Modern Transport, No. 965, September 11, p. 3.
Important alterations on Metropolitan line. (1 800 words & fig.)

1937 **385 .1 (.51) & 656 .1 (.51)**
Modern Transport, No. 965, September 11, p. 5.
MIDDLETON SMITH (C. A.). — **Transport in China.** (1 800 words & fig.)

1937 **385. (091 (.94)**
Modern Transport, No. 965, September 11, p. 6.
Australia's new railway. (1 200 words & fig.)

1937 **656. (.62)**
Modern Transport, No. 965, September 11, p. 8.
Railways and roads in Egypt. (2 100 words.)

1937 **656 .21 (.931)**
Modern Transport, No. 966, September 18, p. 3.
Railway improvements in New-Zealand. (3 000 words & fig.)

1937 **621 .43 (.494)**
Modern Transport, No. 966, September 18, p. 5.
Diesel-engined railcars in Switzerland. (1 400 words & fig.)

1937 **621 .135.3**
Modern Transport, No. 966, September 18, p. 6.
Locomotive springs. Features of design. (1 000 words.)

1937 **388. (.42)**
Modern Transport, No. 966, September 18, p. 7.
SCHREINER (H.). — **Traffic congestion in London.** A suggested means of alleviation. (2 000 words & fig.)

1937 **625 .7 (.43)**
Modern Transport, No. 967, September 25, p. 3.
REISMANN (O.). — Germany's State **motor roads.** (1 500 words & fig.)

1937 **625 .235 (.42)**
Modern Transport, No. 967, September 25, p. 4.
L. N. E. R. « **Coronation** » **expresses.** (600 words & fig.)

1937 **621 .43 (.82)**
Modern Transport, No. 967, September 25, p. 5.
Diesel railcars for Argentina. (2 500 words & fig.)

1937 **624. (.489)**
Modern Transport, No. 967, September 25, p. 7.
New Danish rail and road bridge. (1 700 words & fig.)

1937 **656 .1 (.42)**
Modern Transport, No. 967, September 25, p. 9.
Present position of road transport. (2 500 words & fig.)

1937 **621 .33 & 621 .43**
Modern Transport, No. 967, September 25, p. 12.
WALTON (J. B.). — **Goods vehicle** types compared. (2 000 words.)

1937 **347 .763.5 (.42) & 656 .1 (.42)**
Modern Transport, No. 967, September 25, p. 13.
SANDELSON (D. I.). — **Effects of legislation on road haulage.** Coercive features of recent acts. Urgent need for remedial measures. (3 400 words.)

1937 **621 .132.3 (.42) & 625 .232 (.42)**
Modern Transport, No. 968, October 2, p. 3.
Further L. N. E. R. **streamlined rolling stock.** (2 100 words & fig.)

1937 **656 .252**
Modern Transport, No. 968, October 2, p. 3.
Coloured headlights. Are they of any use ? Evidence inconclusive-states report. (800 words.)

1937 **621 .132.5 (.73)**
Modern Transport, No. 968, October 2, p. 5.
High speed passenger locomotives in the United States. (1 700 words & fig.)

1937 **656 .233**
Modern Transport, No. 968, October 2, p. 9.
Problem of **railway joint lines.** (1 600 words & tables.)

1937 **659**

Modern Transport, No. 969, October 9, p. 4.

Railway salesmanship. Revised booklet for L. M. S. canvassers. (400 words.)

1937 **621 .132.3 (.42) & 625 .232 (.42)**

Modern Transport, No. 969, October 9, p. 5.

New facilities for Norwich-London passengers. (1 500 words & fig.)

1937 **621 .337**

Modern Transport, No. 969, October 9, p. 6.

Electric train control. (900 words.)

1937 **621 .335 (.489) & 621 .43 (.489)**

Modern Transport, No. 969, October 9, p. 9.

Diesel-electric railcars in Denmark. (900 words & fig.)

1937 **621 .132.8 (.73) & 621 .43 (.73)**

Modern Transport, No. 970, October 16, p. 3.

New motive power for Baltimore and Ohio Railroad. (2 200 words & fig.)

1937 **625 .143.5 (.42)**

Modern Transport, No. 970, October 16, p. 4.

Flat-bottom rails. (400 words.)

1937 **625 .1 (.725)**

Modern Transport, No. 970, October 16, p. 4.

New Mexican Railways. (600 words & 1 map.)

1937 **621 .43 & 621 .89**

Modern Transport, No. 970, October 16, p. 11.

RICARDO (H. R.). — **Lubrication of internal combustion engines.** — A summary of thirty papers. (2 000 words.)

1937 **621 .131.3 (.436) & 625 .245 (.436)**

Modern Transport, No. 970, October 16, p. 15.

KARNER (E.). — **Dynamometer car for Austrian railways.** (1 700 words & fig.)

Proceedings, American Society of Civil Engineers. (New York.)

1937 **385 .21**

Proceedings, Amer. Soc. of Civil Engineers, No. 7, September, p. 1230.

Water transportation versus rail transportation. The value of water transportation. The high cost of inland water transportation. (12 000 words & tables.)

1937 **624. (0 & 691**

Proceedings, Amer. Soc. of Civil Engineers, No. 7, September, p. 1277.

Pre-stressed reinforced concrete and its possibilities for bridge construction. (10 000 words & fig.)

1937 **721 .1**

Proceedings, Amer. Soc. of Civil Engineers, No. 7, September, p. 1303.

Practical application of soil mechanics. Levees in the lower Mississippi Valley. Quabbin dike built by the hydraulic fill method. Stability of embankment foundations. Settlement of structures in Europe and methods of observation. (26 000 words, fig. & tables.)

Proceedings, Institution of Mechanical Engineers. (London.)

1937 **621 .43**

Proceedings, Instit. of Mechanical Engineers, Vol. 135, p. 35.

BAKER (H. W.). — **Piston temperatures in a sleeve valve oil engine.** (11 000 words & fig.)

1937 **171**

Proceedings, Instit. of Mechanical Engineers, Vol. 135, p. 171.

DOLBY (E. R.). — **Ventilation with air conditioning** in modern buildings. (16 800 words & fig.)

1937 **385 .586**

Proceedings, Instit. of Mechanical Engineers, Vol. 135, p. 223

FLEMING (A. P. M.). — **Training of apprentices for craftsmanship.** (19 000 words.)

1937 **62. (01**

Proceedings, Instit. of Mechanical Engineers, Vol. 135, p. 467.

LEAN (R. G.) and QUINNEY (H.). — The development of a machine for **high speed testing of materials.** (4 500 words & fig.)

Railway Age. (New York.)

1937 **625 .144.1 (.73)**

Railway Age, No. 10, September 4, p. 300.

Delaware & Hudson installs **more welded track.** (2 600 words & fig.)

1937 **625 .246 (.73)**

Railway Age, No. 10, September 4, p. 305.

STUEBING (A. F.). — **Freight-car** construction of high-tensile steel. (3 300 words & tables.)

1937 **385. (.73)**

Railway Age, No. 10, September 4, p. 308.

Miller favors one big railroad. — I. C. C. chairman believes unified system would simplify rates, reduce waste — suggests trainload rates. (3 000 words.)

1937 **621 .132.5 (.73)**

Railway Age, No. 10, September 4, p. 312.

B. & L. E. receives ten **2-10-4 locomotives.** (600 words.)

1937 **621 .138 (.73)**

Railway Age, No. 11, September 11, p. 330.

Maintenance of **high-speed motive power** and equipment. (3 400 words.)

1937 656 .222.6 (.73)
Railway Age. No. 11, September 11, p. 333.
Operating fast **freight trains.** (1 600 words.)

1937 313 : 625 .173 (.73)
Railway Age. No. 11. September 11, p. 338.
Story of tie renewals in 1936. (800 words & tables.)

1937 656 .222.5 (.73) & 659 (.73)
Railway Age. No. 12. September 18. p. 363.
How the Southern Pacific is **modernizing its passenger service.** (2 200 words & fig.)

1937 62. (01 & 693
Railway Age, No. 12, September 18, p. 367.
How permanent is concrete ? (6 600 words & fig.)

1937 347 .763.5 (.73) & 656 .1 (.73)
Railway Age. No. 12. September 18. p. 373.
Highway freight carriers classified by I. C. C. (1 200 words & fig.)

1937 625 .232 (.73)
Railway Age. No. 12. September 18. p. 375.
The New York Central system **modernizes passenger cars.** (1 800 words & fig.)

1937 621 .335 (.73) & 621 .213 (.73)
Railway Age. No. 13. September 25. p. 396.
All-purpose diesel-electric locomotive. (1 800 words & fig.)

1937 385 .1
Railway Age. No. 13. September 25. p. 399.
DICK (F. R.). — **Do roads need to earn anything ?** (4 800 words.)

1937 625 .231 (.73)
Railway Age. No. 13. September 25. p. 403.
The Lehigh Valley builds all-steel cabooses. (800 words & fig.)

1937 625 .1 (06 (.73)
Railway Age. No. 13. September 25, p. 405. and No. 14. October 2. p. 448.
Roadmasters meet in Chicago. — The housing of track labor. Report on maintenance of rail joints. Operation of motor-cars to avoid accidents. Good workmanship in laying rail. The trackman's part in safety at highway crossings. etc. (11 500 words.)

1937 656 (.73)
Railway Age. No. 13. September 25. p. 411.
Freight forwarders should discard shipper role. (4 100 words.)

1937 621 .131.7 (.73)
Railway Age, No. 13, September 25. p. 415.
Would **require stokers on big locomotives.** (2 200 words.)

1937 656 .1 (.71) & 656 .261 (.71)
Railway Age. No. 13. September 25, p. 417.
MULLER (W. E.). — **Co-ordinating trucks and trains in Canada.** (2 600 words & fig.)

1937 656 .261 (.73)
Railway Age. No. 13, September 25, p. 420.
Giving shippers what they want. (1 200 words.)

1937 621 .132.3 (.73)
Railway Age, N° 14, October 2, p. 442.
Southern Pacific streamliners. (1 500 words & fig.)

1937 625 .236 (.73)
Railway Age, N° 14, October 2, p. 444.
Low-alloy steel for car construction. (800 words, tables & fig.)

1937 385 .3 (.73) & 656 .27 (.73)
Railway Age. No. 14. October 2. p. 453.
Here's that co-ordinator again. — « Posthumous » reports of sections of research and transportation service consider problems of short lines and thin-traffic branches. (3 400 words.)

Railway Engineering and Maintenance. (Chicago.)

1937 621 .392 (.73) & 625 .143 (.73)
Railway Engineering and Maintenance, September p. 596.
30 more miles of welded track. (5 000 words & fig.)

1937 625 .142 & 625 .173
Railway Engineering and Maintenance, September p. 601.
PETERSON A. H. — Comparative economy in **crosstie renewals.** (1 300 words & fig.)

1937 625 .143 (.73)
Railway Engineering and Maintenance, September p. 602.
Getting the most from rail. (3 100 words & fig.)

1937 698
Railway Engineering and Maintenance, September p. 606.
BROWNE (F. L.). — **The fading of painted surfaces** (2 200 words.)

1937 625 .172 (.73)
Railway Engineering and Maintenance, September p. 608.
Spray cars embody noteworthy features. (1 600 words & fig.)

1937 721 .6 (.73)
Railway Engineering and Maintenance, September p. 611.
Asphaltic surface increases life of platform planking (1 200 words & fig.)

1937 691. (.73) & 693. (.73)
Railway Engineering and Maintenance, October, p. 69[illegible]
Good results with vibrated concrete. (800 words & fig.)

1937 **625 .122 (.73)**
ilway Engineering and Maintenance, October, p. 697.
Pennsylvania constructs novel grouted bank revet-ent. (1 000 words & fig.)

1937 **62. (01 & 624 .1**
ilway Engineering and Maintenance, October, p. 698.
Pi[illegible]ng inspected with increment borers on C. B. & Q. 00 words & fig.)

1937 **625 .1 (06 (.73)**
ilway Engineering and Maintenance, October, p. 699.
Fifty-second annual roadmasters' convention, 14-16 eptember 1937. — Papers presented: The trackman's sponsibility for the safety of highway crossings. The ring of soft roadbed. Relationship between the ores and maintenance of way departments. Good actice in the laying of rail to secure workmanlike sults. The roadmaster's responsibility for tie life ne operation of motor cars to avoid accidents. The aintenance of rail joints. The housing of track labor. ne track supply exhibit. (45 000 words & fig.)

Railway Gazette. (London.)

1937 **625 .244**
ilway Gazette, No. 11, September 10, p. 440.
The transport of food. (900 words.)

1937 **621 .392 & 625 .143.4**
ilway Gazette, No. 11, September 10, p. 441.
Welding bull-head rails by the Katona method. (1 500 ords & fig.)

1937 **656 .25 (.43)**
ilway Gazette, No. 11, September 10, p. 443.
Signalling on the German State Railways. (2 900 ords & fig.)

1937 **621 .138.5 (.42)**
ilway Gazette, No. 11, September 10, p. 448.
Locomotive weighing machines, L. N. E. R. (1 000 ords & fig.)

1937 **621 .94 (.42)**
ailway Gazette, No. 11, September 10, p. 450.
A new tool grinding machine. (300 words & fig.)

1937 **385. (091 (.51)**
ailway Gazette, No. 12, September 17, p. 470.
Peiping-Suiyuan railway. (2 100 words & fig.)

1937 **621 .392 (.42)**
ailway Gazette, No. 12, September 17, p. 473.
Electric spot welding at Doncaster Works, L. N. E. R. 00 words & fig.)

1937 **625 .1 (.42) & 656 .21 (.42)**
ailway Gazette, No. 12, September 17, p. 474.
Engineering works at Earls Court. (3 400 words & .)

1937 **625 .235 (.42)**
Railway Gazette, No. 12, September 17, p. 484.
The use of **aluminium in railway coaches.** (500 words & fig.)

1937 **656 .281 (.42)**
Railway Gazette, No. 12, September 17, p. 488, and No. 14, October 1, p. 567.
Ministry of Transport **accident report.** (4 600 words.)

1937 **656 .222.5 (.42)**
Railway Gazette, N° 13, September 24, p. 515.
The Midland timetable organisation. (2 300 words.)

1937 **388. (.42) & 621 .33 (.42)**
Railway Gazette, No. 13, September 24, p. 521.
Trolleybus progress in London. (2 700 words & fig.)

1937 **656 .225 (.485)**
Railway Gazette, No. 13, September 24, p. 528.
Insulated containers in Sweden. — A new type of container for fish traffic designed for easy transport on the standard platform truck. (400 words & fig.)

1937 **625 .215 (.42)**
Railway Gazette, No. 13, September 24, p. 529.
Bogie control gear for high-speed trains. — Special design on the Coronation Scot. L. M. S. R. (300 words & fig.)

1937 **625 .232 (.54)**
Railway Gazette, No. 13, September 24, p. 530.
Some new ideas in **tropical restaurant car design.** (400 words & fig.)

1937 **656 .25 (.494)**
Railway Gazette, No. 14, October 1, p. 552.
Automatic signalling in Switzerland. (700 words & fig.)

1937 **621 .94 (.42)**
Railway Gazette, No. 14, October 1, p. 553.
A new **high-speed grinding machine.** (1 100 words & fig.)

1937 **656 .23 (.4)**
Railway Gazette, No 14, October 1, p. 555.
WIENER (L.). — **Tariff distances.** (2 100 words.)

1937 **621 .132.3 (.42)**
Railway Gazette, No. 14, October 1, p. 557.
The West Riding Limited. New streamlined trains for high-speed London-Leeds-Bradford service, L.N.E.R. (1 000 words & fig.)

1937 **621 .132.6 (.439)**
Railway Gazette, No. 14, October 1, p. 559.
New streamlined 4-4-4 tank engine, Hungarian State Railways. (500 words & fig.)

1937 **625 .144.4 (.54)**
Railway Gazette, No. 14, October 1, p. 560.
Portable sleeper-adzing machine, Burma Railways. (400 words & fig.)

1937 **656 .222.1 (.42)**
Railway Gazette, No. 14, October 1, p. 571.
Inaugural runs of the West Riding Limited, L.N.E.R. (1 500 words.)

1937 **625 .172 (.42)**
Railway Gazette, No. 15, October 8, p. 604.
Weed-killing on Railways with dusting powder. (600 words & fig.)

1937 **385 .114 (.494)**
Railway Gazette, No. 15, October 8, p. 605.
Rationalisation on the Swiss Federal Railways. (1 200 words.)

1937 **621 .132.8 (.73)**
Railway Gazette, No. 15, October 8, p. 606.
A sixteen-cylinder locomotive. (600 words & fig.)

1937 **656 .212.5 (.54)**
Railway Gazette, No. 15, October 8, p. 607.
New hump yard at Naihati, Eastern Bengal Railway. (700 words & fig.)

1937 **625 .14 (.42) & 656 .222.1 (.42)**
Railway Gazette, No. 15, October 8, p. 608.
BOND (W. M.). — **Track improvements** for the Coronation Scot. (800 words.)

1937 **625 .172 (.42)**
Railway Gazette, No. 15, October 8, p. 608.
Hallade track recorder. (1 000 words & fig.)

1937 **385. (093 (.42)**
Railway Gazette, No. 15, October 8, p. 610.
LEE (Ch. E.). — Ralph Allen's Combe down wagonway, Bath. — Some particulars and illustrations of the earliest railway of which a detailed description has survived. (2 000 words & fig.)

1937 **621 .132.3 (.489)**
Railway Gazette, No. 15, October 8, p. 613.
Swedish engines for Denmark. (300 words & fig.)

1937 **621 .132.5 (.51)**
Railway Gazette, No. 15, October 8, p. 617.
Belgian built 2-10-2 locomotives for China. (200 words & fig.)

1937 **656 .211.7 (.42 + .494)**
Railway Gazette, No. 15, October 8, p. 619.
New Dover-Ostend Ms. « Prins Albert ». (700 words.)

1937 **656 .283 (.42)**
Railway Gazette, No. 15, October 8, p. 620, and No. 16, October 15, p. 656.
Ministry of Transport accident report. (2 700 words.)

1937 **621 .89**
Railway Gazette, No. 16, October 15, p. 640.
The problem of lubrication. (1 300 words.)

1937 **621 .87 (.54)**
Railway Gazette, No. 16, October 15, p. 641.
New-steam breakdown crane for the South Indian Railway. (600 words & fig.)

1937 **656 .257 (.44)**
Railway Gazette, No. 16, October 15, p. 642.
Power signalling at the Gare du Nord (Paris). (1 100 words & fig.)

1937 **656 .225 (.42)**
Railway Gazette, No. 16, October 15, p. 644.
Fruit and flower traffic, Southern Railway. (800 words & fig.)

1937 **621 .132.3 (.42) & 625 .232 (.42)**
Railway Gazette, No. 16, October 15, p. 647.
The East Anglian express. (1 200 words & fig.)

1937 **621 .94**
Railway Gazette, No. 16, October 15, p. 649.
Milling locomotive components. (300 words & fig.)

1937 **621 .138 (.73)**
Diesel Railway Traction. p. 578, Suppl. to the Railway Gazette, October 1.
The maintenance of streamliners. (2 200 words & fig.)

1937 **621 .43 (.73)**
Diesel Railway Traction, p. 580, Supplt. to the Railway Gazette, October 1.
Main-line locomotives in America. (1 000 words & fig.)

1937 **621 .43 (.44)**
Diesel Railway Traction, p. 582, Supplt. to the Railway Gazette, October 1.
Railcar oil engines. (3 300 words & fig.)

1937 **621 .43 (.85)**
Diesel Railway Traction, p. 587, Supplt. to the Railway Gazette, October 1.
Light-weight railcars of unusual design. (400 words & fig.)

1937 **621 .43 (.82)**
Diesel Railway Traction, p. 588, Supplt. to the Railway Gazette, October 1.
More British railcars **for South America.** (1 900 words & fig.)

1937 **621 .43**
Diesel Railway Traction, p. 591, Supplt. to the Railway Gazette, October 1.
Supercharging. (700 words.)

1937 **621 .338 (.42)**
Electric Railway Traction, p. 498, Supplt. to the Railway Gazette, September 17.
New electric trains for London transport. (2 000 words & fig.)

1937 **625 .4 (.45)**
Electric Railway Traction. p. 503, Supplt. to the Railway Gazette, September 17.
HUG (Ad.-M.). — Two new **mountain cable lines.** (400 words & fig.)

1937 **621 .335 (.494)**
Electric Railway Traction. p. 665, Supplt. to the Railway Gazette, October 15.
High speed multiple-unit trains. (300 words & fig.)

1937 **621 .333**
Electric Railway Traction. p. 666, Supplt. to the Railway Gazette, October 15.
CROFT (E. H.). — The compound **motor for urban regenerative trains.** (2 200 words & fig.)

1937 **621 .33 (.485)**
Electric Railway Traction. p. 669, Supplt. to the Railway Gazette. October 15.
ELLIS (C. H.). — **The Gothenburg-Boras Railway electrification.** (800 words & fig.)

1937 **625 .26 (.436)**
Electric Railway Traction. p. 670, Supplt. to the Railway Gazette. October 15.
Innsbruck running shed and repair shop. (1 300 words & fig.)

Railway Magazine. (London.)

1937 **385. (092 (.42)**
Railway Magazine, No. 484, October. p. 239.
The first G. W. R. superintendent of locomotives. (1 900 words & fig.)

1937 **656 .222.1 (.42)**
Railway Magazine, No. 484. October, p. 246.
ALLEN (C. J.). — **British locomotive practice and performance.** (3 500 words & fig.)

1937 **385. (091 (.485)**
Railway Magazine. No. 484, October, p. 259.
ELLIS (C. H.). — **The Railways of Sweden.** — Part II. (3 200 words & fig.)

1937 **385. (09 (.42)**
Railway Magazine. No 484. October, p. 269.
PERKINS (T. R.). — In memoriam. **The Bishop's Castle Railway.** (2 800 words & fig.)

1937 **621 .132.1 (.42)**
Railway Magazine, No. 484, October. p. 279.
BARRIE (D. S.). — The locomotives of the L. N. W. R. 1897-1922. (3 500 words & fig.)

Railway Mechanical Engineer. (New York.)

1937 **621 .13 (0**
Railway Mechanical Engineer, No. 9, September, p. 381.
Design features of **lightweight modern locomotive equipment.** — II. (3 000 words, fig. & tables.)

1937 **621 .13 (06 (.73)**
Railway Mechanical Engineer, No. 9, September, p. 387.
Fuel and travelling engineers' meeting. (2 200 words & fig.)

1937 **621 .133 (06 (.73)**
Railway Mechanical Engineer, No. 9, September, p. 389.
Master Boiler Makers Association. (1 900 words & fig.)

1937 **625 .2 (06 (.73)**
Railway Mechanical Engineer, No. 9, September, p. 393.
Car department officers' meeting. (2 000 words & fig.)

1937 **625 .253 (.73) & 621 .138.5 (.73)**
Railway Mechanical Engineer, No. 9, September, p. 411.
BIRCH (T. H.). — Devices for repairing AB brake valves. (1 000 words & fig.)

1937 **625 .26 (.73)**
Railway Mechanical Engineer, No. 9, September, p. 412.
Rebuilding gondolas at North Proviso. (900 words & fig.)

Railway Signaling. (Chicago.)

1937 **347 .763 (.73) & 656 .25 (.73)**
Railway Signaling, September, p. 505.
Signal inspection bill passed by Congress. (1 500 words.)

1937 **656 .256.3 (.73)**
Railway Signaling, September, p. 506.
Rock Island installs **automatic blocks.** (4 800 words & fig.)

1937 **656 .253 (.54)**
Railway Signaling, September, p. 512.
Color-light signaling in India. (2 400 words & fig.)

1937 **385 .3 (.73) & 656 .254 (.73)**
Railway Signaling, September, p. 515.
Rock-Island train control petition denied. (1 500 words.)

1937 **656 .254 (.73) & 656 .256.3 (.73)**
Railway Signaling, September, p. 516.
A. P. B., remote control and C. T. C. on the Baltimore and Ohio. (5 000 words & fig.)

1937 **654 (.73)**
Railway Signaling, September, p. 523.
ROGERS (W.). — **Teletype service** on Missouri Pacific. (1 500 words & fig.)

1937 **656 .254 (.73)**
Railway Signaling, September, p. 525.
Zephyr **train telephones.** (700 words & fig.)

1937 **656 .258 (.73)**
Railway Signaling, October, p. 565.
Remote control switch expedites trains at a junction on the Union Pacific. (2 100 words & fig.)

1937 **656 .254 (.73)**

Railway Signaling, October, p. 569.

C. T. C. on the Denver & Rio Grande Western. (3 500 words & fig.)

1937 **656 .254 (.73) & 656 .258 (.73)**

Railway Signaling, October, p. 573.

Remote control by Code. (2 700 words & fig.)

1937 **656 .254 (.73)**

Railway Signaling, October, p. 576.

Ends of double track controlled by C. T. C. (5 000 words & fig.)

1937 **656 .254 (06 (.73)**

Railway Signaling, October, p. 585.

T. & T. convention at Chicago. (4 900 words & fig.)

1937 **656 .254 (.73)**

Railway Signaling, October, p. 589.

Rock Island carrier systems. (2 100 words & fig.)

1937 **656 .254 & 656 .258**

Railway Signaling, October, p. 591.

Route control interlocking. — A new signaling development. (1 900 words.)

The Locomotive. (London.)

1937 **621 .43 (.85)**

The Locomotive, No. 541, September 15, p. 270.

Light-weight railcars, Central Railway of Peru. (2 100 words & fig.)

1937 **621 .132.5 (.51)**

The Locomotive, No. 541, September 15, p. 273.

2-10-0 locomotive, Lung-Hai line, Chinese Govt Rys. (800 words & fig.)

1937 **621 .133**

The Locomotive, No. 541, September 15, p. 276.

The « Velox » steam generator. (2 000 words & fig.)

1937 **621 .335 (.44) & 621 .338 (.44)**

The Locomotive, No. 541, September 15, p. 279.

New french electric trains. (800 words & fig.)

1937 **621 .132.1 (.471)**

The Locomotive, No. 541, September 15, p. 280.

Locomotives of the Finnish State Railways. (1 600 words & fig.)

1937 **621 .132.1 (.41)**

The Locomotive, No. 541, September 15, p. 283.

REED (K. H.) and FAYLE (H.). — Recent developments of Irish **locomotive practice,** Great Southern Railways. (800 words & fig.)

1937 **625 .242 (.42)**

The Locomotive, No. 541, September 15, p. 284.

Shock-absorbing wagons, L. M. & S. R. (1 000 words & fig.)

1937 **621 .13 (01**

The Locomotive, No. 541, September 15, p. 293, and No. 542, October 15, p. 323.

PHILLIPSON (E. A.). — The steam locomotive in traffic. (2 700 words.)

1937 **625 .172 (.42)**

The Locomotive, No. 541, September 15, p. 295.

Weed-killing train, Southern Railway. (900 words & fig.)

1937 **621 .132.3 (.62)**

The Locomotive, No. 542, October 15, p. 304.

4-4-0 passenger locomotives with Caprotti valve gear, Egyptian State Railways. (600 words & fig.)

1937 **621 .132.5 (.51)**

The Locomotive, No. 542, October 15, p. 305.

2-10-2 **locomotive, Tientsin-Pukow Railway.** (1 300 words & fig.)

1937 **621 .335 (.42)**

The Locomotive, No. 542, October 15, p. 306.

New Russian electric locomotives. (1 900 words.)

1937 **621 .132.1 (.41)**

The Locomotive, No. 542, October 15, p. 309.

REED (K. H.) and FAYLE (H.). — **Recent developments of Irish locomotive practice,** Great Southern Railways. (1 400 words & fig.)

1937 **621 .132.8 (.73**

The Locomotive, No. 542, October 15, p. 311.

Sixteen-cyl. 4-8-4 locomotive, Baltimore & Ohio R. R. (700 words.)

1937 **621 .135 (0**

The Locomotive, No. 542, October 15, p. 314.

Lateral thrusts at high speeds. (800 words.)

1937 **621 .132.6 (.42**

The Locomotive, No. 542, October 15, p. 316.

New locomotives for German secondary railways. (90 words & fig.)

1937 **625 .232 (.42) & 656 .222.1 (.42**

The Locomotive, No. 542, October 15, p. 318.

The « West Riding Limited », L. N. E. R. (2 20 words & fig.)

1937 **621 .43**

The Locomotive, No. 542, October 15, p. 322.

The Marshall diesel tractor (adopted for shunting railway wagons). (600 words & fig.)

1937 **621 .335 (.460)**

The Locomotive, No. 542, October 15, p. 325.

Spanish electric locomotives. (1 800 words & fig.)

1937 **621 .135.3 & 625 .213**

The Locomotive, No. 542, October 15, p. 328.

SANDERS (T. H.). — **The Belleville washer spring.** (2 800 words & fig.)

The Oil Engine. (London.)

1937 **536 & 621 .43**

The Oil Engine, No 53, Mid September, p. 136.

Waste-heat recovery in oil engines. (1 800 words & fig.)

1937 **621 .43 (.44)**

The Oil Engine, No. 53, Mid September, p. 142.

High speed on continental trains. Some recent diesel traction experiences. (900 words & fig.)

1937 **621 .43 (.73)**

The Oil Engine, No. 53, Mid September, p. 166.

MANN (Ch. F. A.). — **The new Rock Island Rockets.** (800 words & fig.)

1937 **621 .43 (.73)**

The Oil Engine, No. 54, Mid October, p. 180.

900 H.P. turbo-charged shunting locomotive. (500 words & fig.)

1937 **621 .43 & 621 .89**

The Oil Engine, No. 54, Mid October, p. 180.

The lubrication of oil engines. (2 700 words & fig.)

1937 **621 .89**

The Oil Engine, No. 54, Mid October, p. 190.

New principles in filtration. Large capacity and ease of cleaning features of new units. (1 600 words & fig.)

1937 **621 .43 (.42) & 656 .25 (.42)**

The Oil Engine, No. 54, Mid October, p. 191.

Stand-by plant for another big railway station. (400 words & fig.)

1937 **621 .43 (.82)**

The Oil Engine, No. 54, Mid October, p. 192.

Streamlined railcars for South America. (800 words & fig.)

In Italian.

La tecnica professionale. (Firenze.)

1937 **621 .8 & 621 .43**

La tecnica professionale, ottobre, p. 224.

SPANI (D. F.). — **Le trasmissioni idrauliche.** (3 800 parole & fig.)

1937 **621 .43**

La tecnica professionale, ottobre, p. 229.

MARTINELLI (M.). — Condizioni di **sicurezza** per la chiusura delle porte **delle automotrici.** (1 400 parole & fig.)

1937 **625 .252**

La tecnica professionale, ottobre, p. 232.

FASOLI (M.). — Il nuovo apparecchio di tipo F. S. per la variazione del rapporto di moltiplicazione della **timoneria del freno.** (2 300 parole & fig.)

Rivista tecnica delle ferrovie italiane. (Roma.)

1937 **656 .256**

Rivista tecnica delle ferrovie italiane, 15 settembre, p. 185.

DORATI (S.). — Calcolo, verifica e tipi dei **circuiti di binario.** (13 000 parole & fig.)

In Dutch.

De Ingenieur. (Den Haag.)

1937 **625 .13**

De Ingenieur, No. 39, 24 September, p. A. 357.

BEYL (Z. S.). — **Ventilatie van tunnels** voor automobielverkeer. (4 300 woorden & fig.)

1937 **62. (01 & 721 .9**

De Ingenieur, No. 40, 1 October, p. Bt. 65.

SLEGT (H.). — **Constructies** belast op **buiging en normaalkracht.** (1 200 woorden & fig.)

Spoor- en Tramwegen. (Utrecht.)

1937 **656**

Spoor- en Tramwegen, No. 20, 28 September, p. 441.

NIEUWENHUIS (J. G.). — **Organisatorische opbouw** van het transportwezen. (3 500 woorden & fig.)

1937 **385. (06.4 (.44)**

Spoor- en Tramwegen, No. 20, 28 September, p. 447.

VAN STAPPEN (J.). — **Spoorwegmateriaal** op de Parijsche tentoonstelling. (1 200 woorden & fig.)

1937 **621 .33 (.492)**

Spoor- en Tramwegen, No. 21, 12 October, p. 467.

VAN LESSEN (J.). — **De electrificatie** van het middennet der Nederlandschen Spoorwegen. (2 000 woorden & fig.)

1937 **621 .43 (.492)**

Spoor- en Tramwegen, No. 21, 12 October, p. 471.

BOLLEMAN-KIJLSTRA (E.). — Nieuwe **Dieselmotorrijtuigen** der Nederlandsche Spoorwegen. (900 woorden & fig.)

1937 **621 .335 (.492)**

Spoor- en Tramwegen, No. 21, 12 October, p. 472.

BOLLEMAN KIJLSTRA (E.). — Het nieuwe **electrische** materieel der Nederlandsche Spoorwegen. (1 600 woorden & fig.)

In Portuguese.

Revista das Estradas de ferro. (Rio de Janeiro.)

1937 **621 .43 (.82)**

Revista das Estradas de ferro, No. 292, 15 de setembro, p. 1738.

A **modernizaçao dos serviços de transportes de passageiros** nas Estradas de ferro do Estado (Argentina). (2 400 palavras & fig.)

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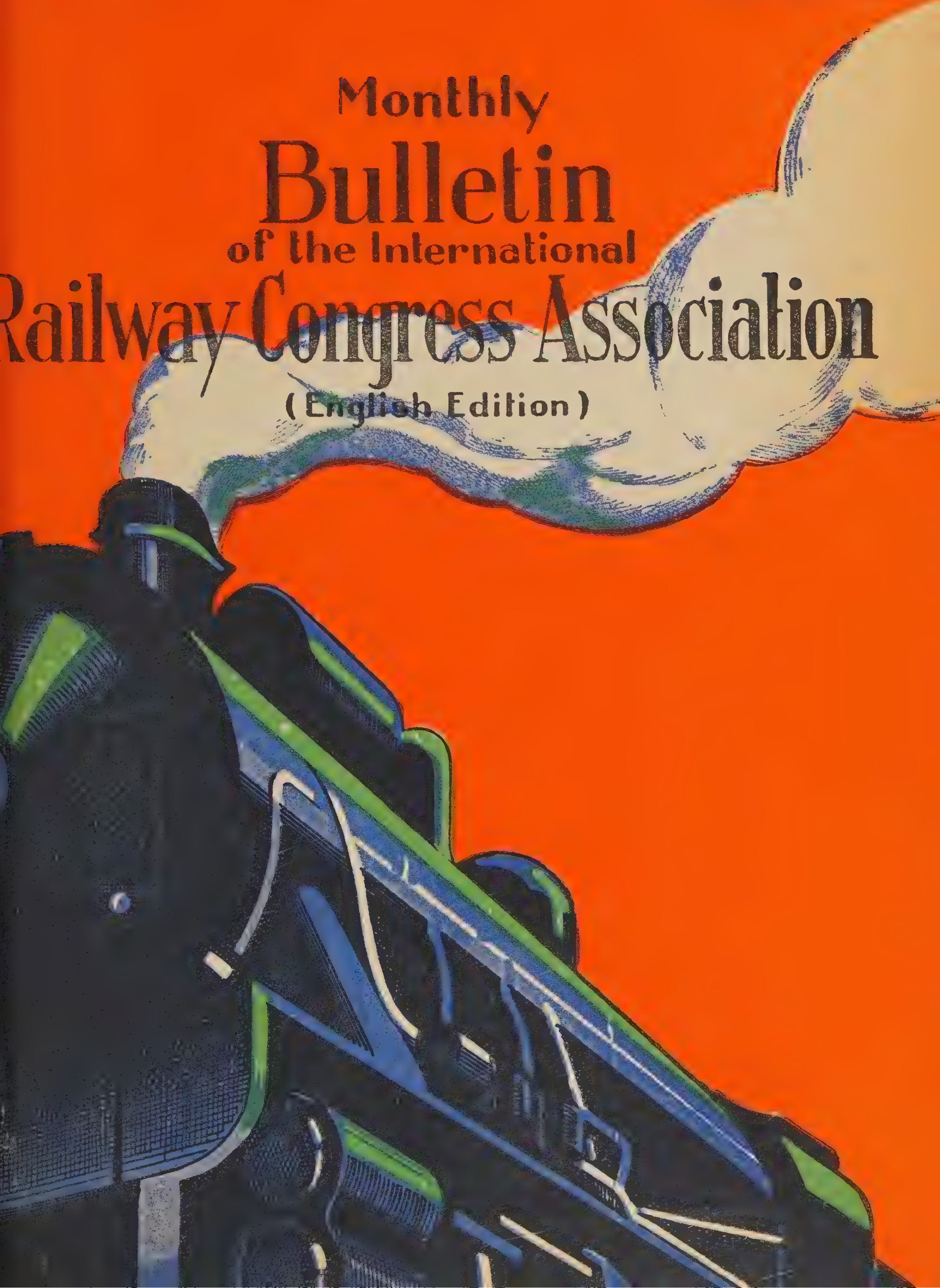

Automatic Train Control

train speed 200 km/h

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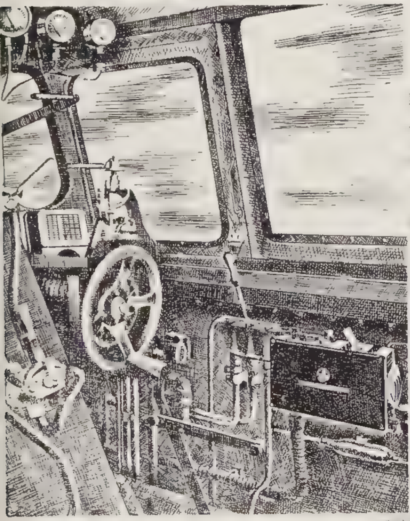
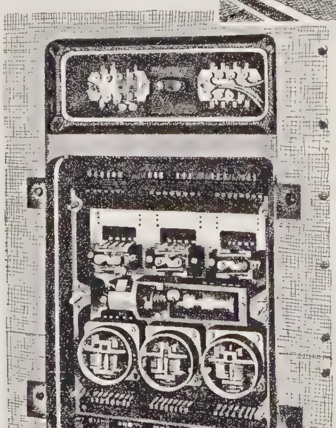


Recording tachometer and brake device in the cab of a streamlined locomotive of the German State Railways.

Apparatus case and locomotive magnet.



Apparatus case, open

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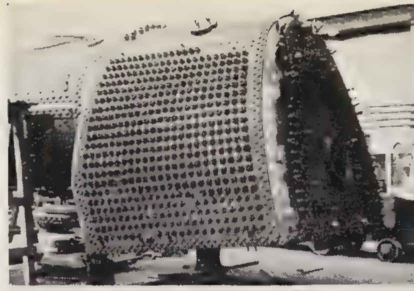

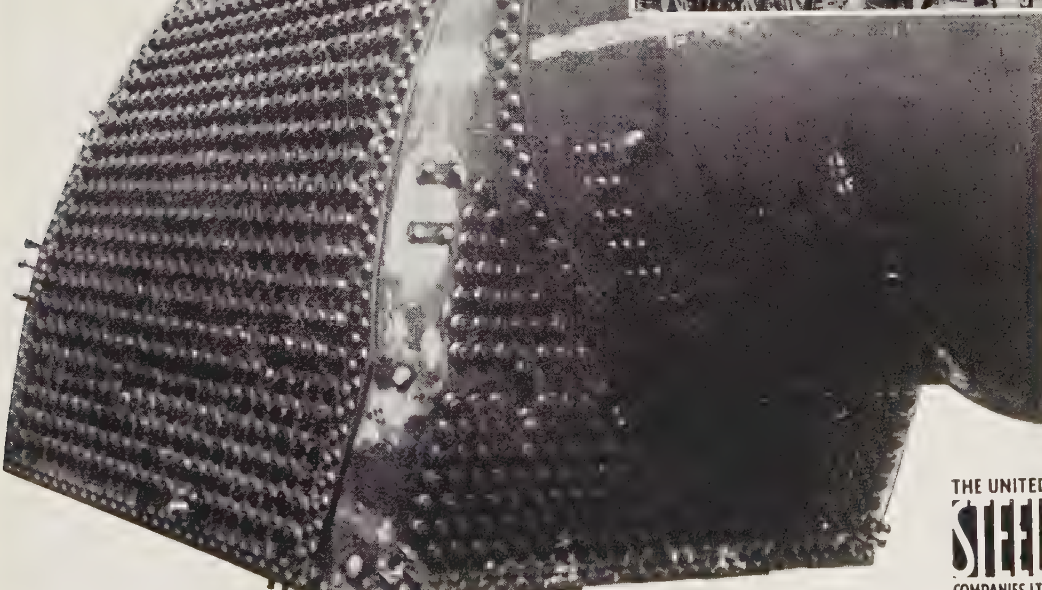

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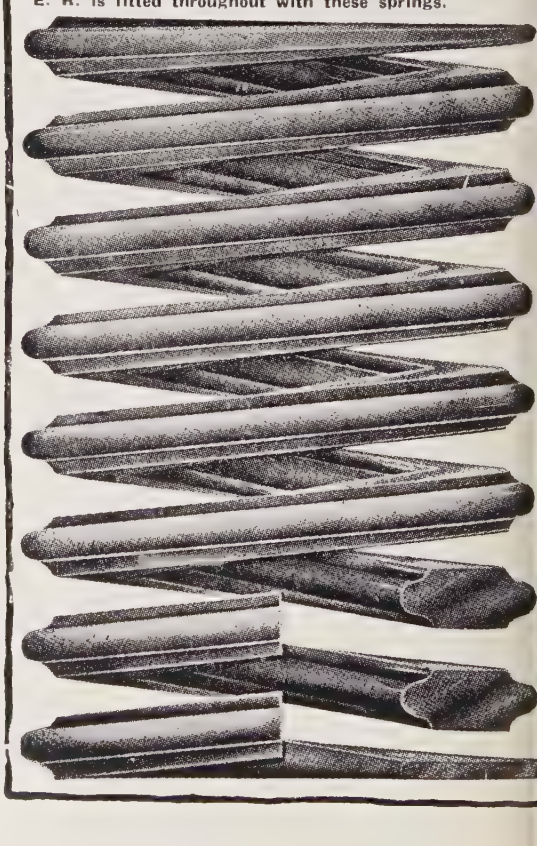

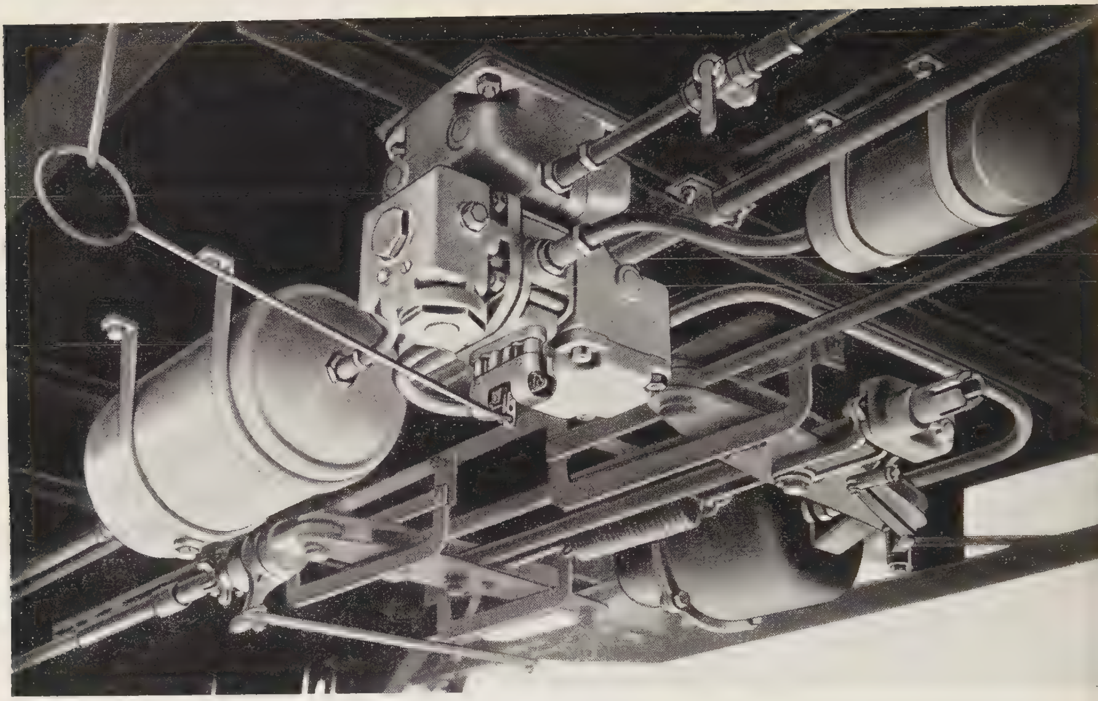

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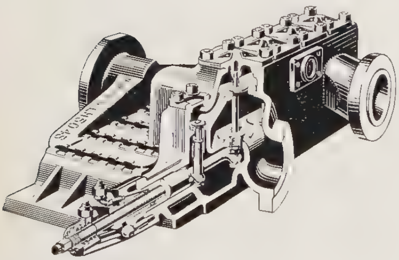

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